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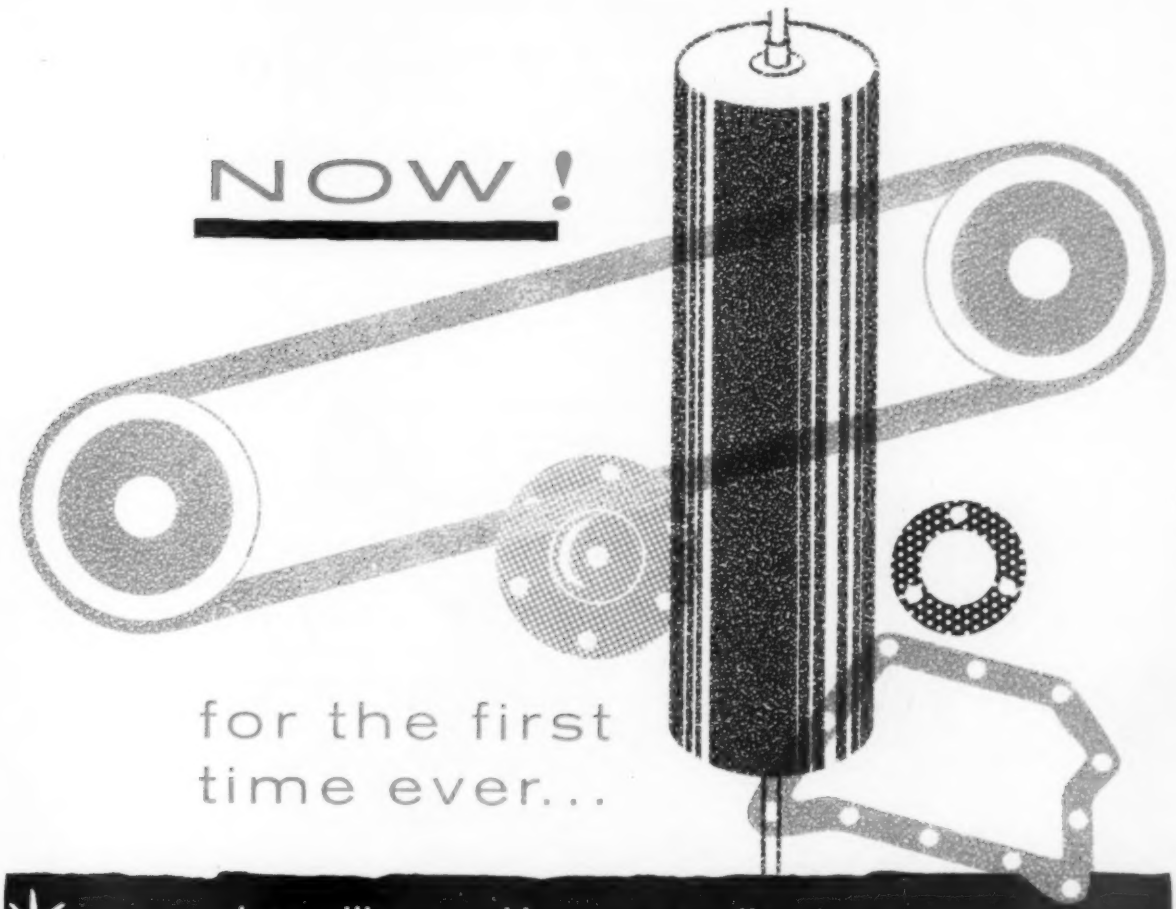

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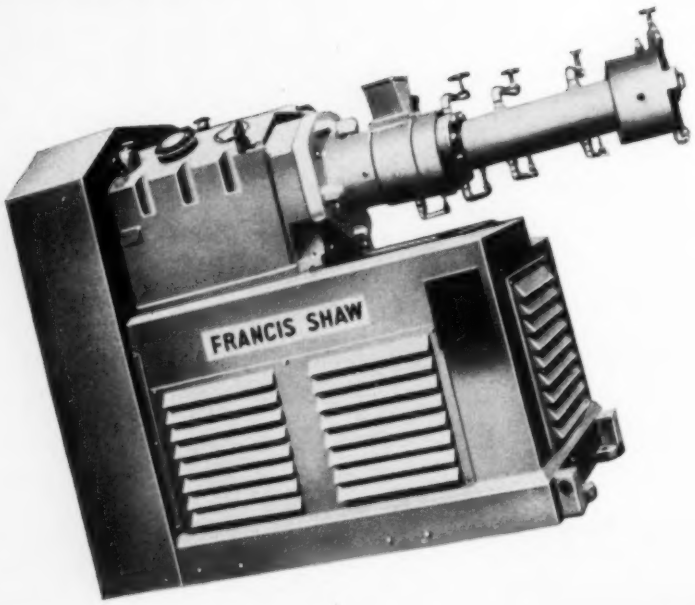

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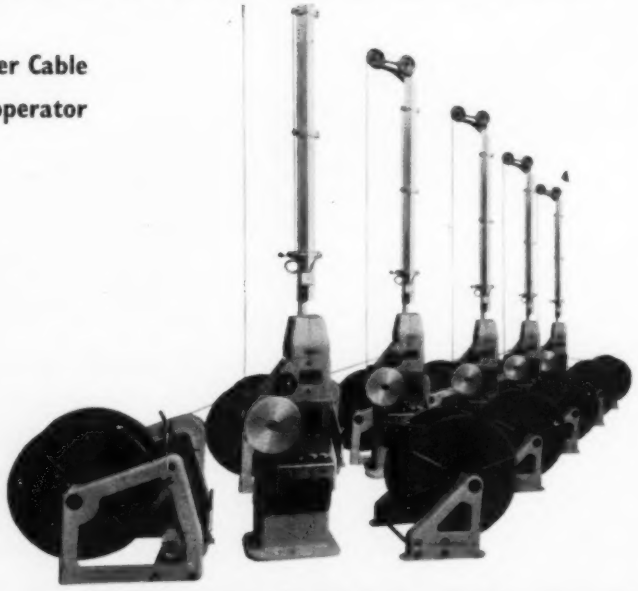

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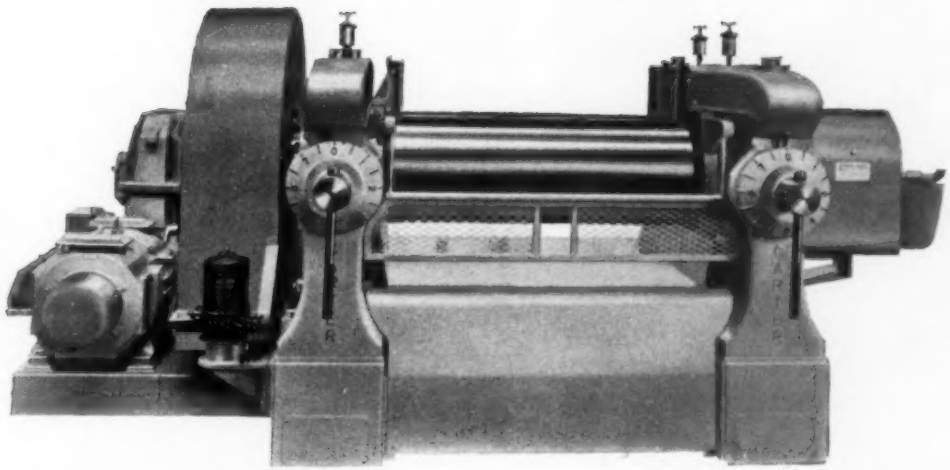

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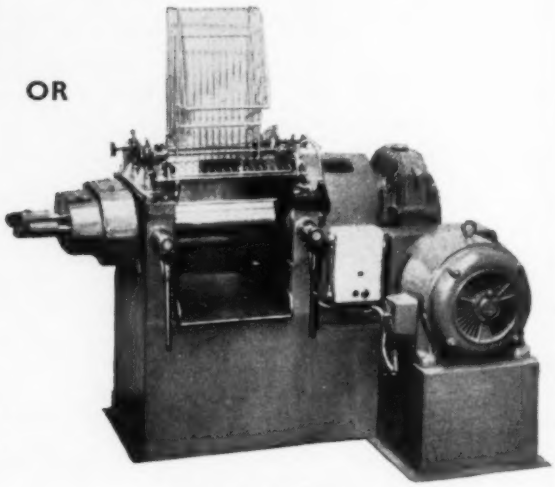

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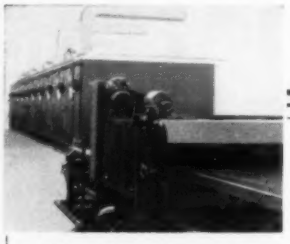

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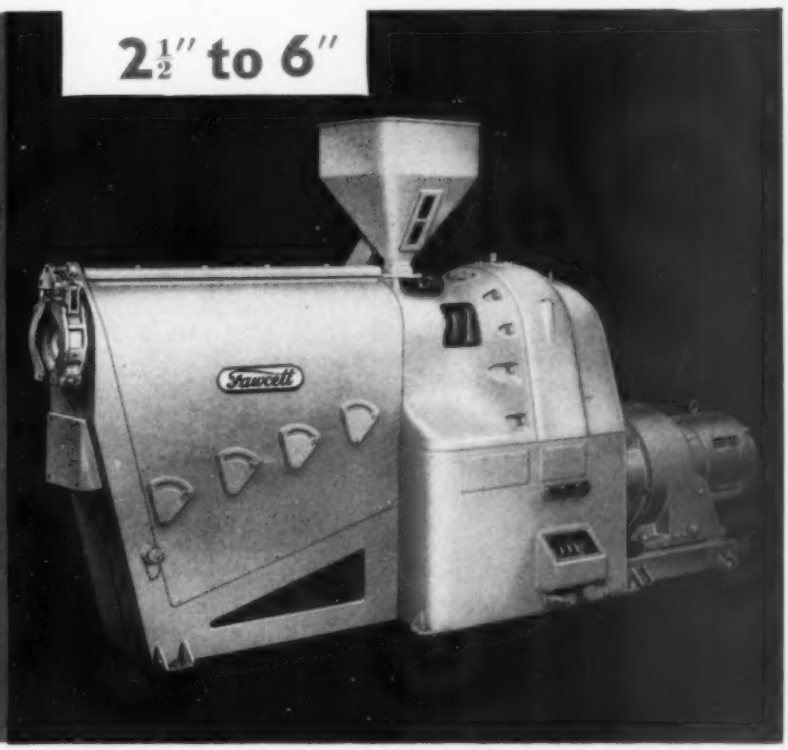

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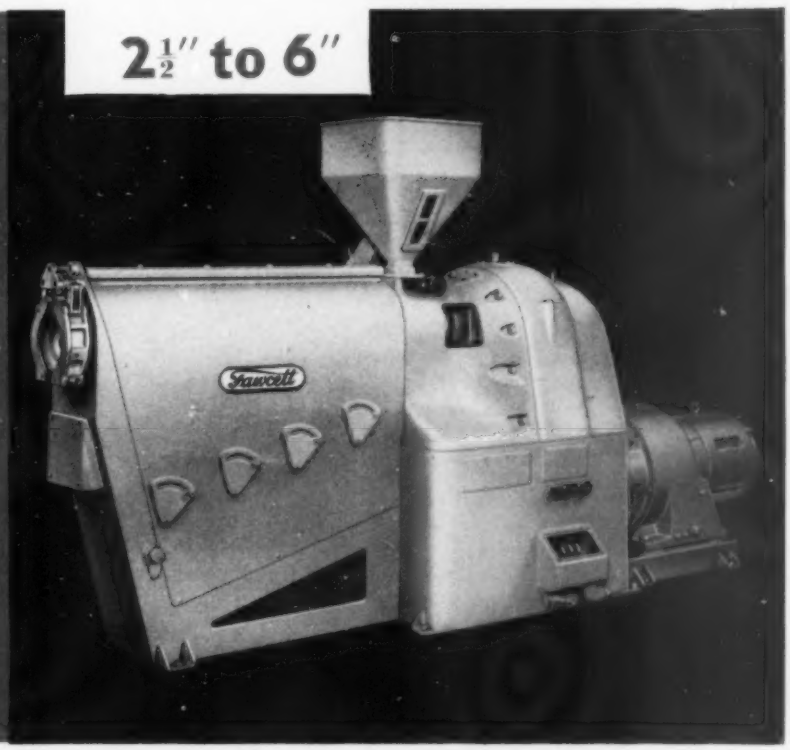

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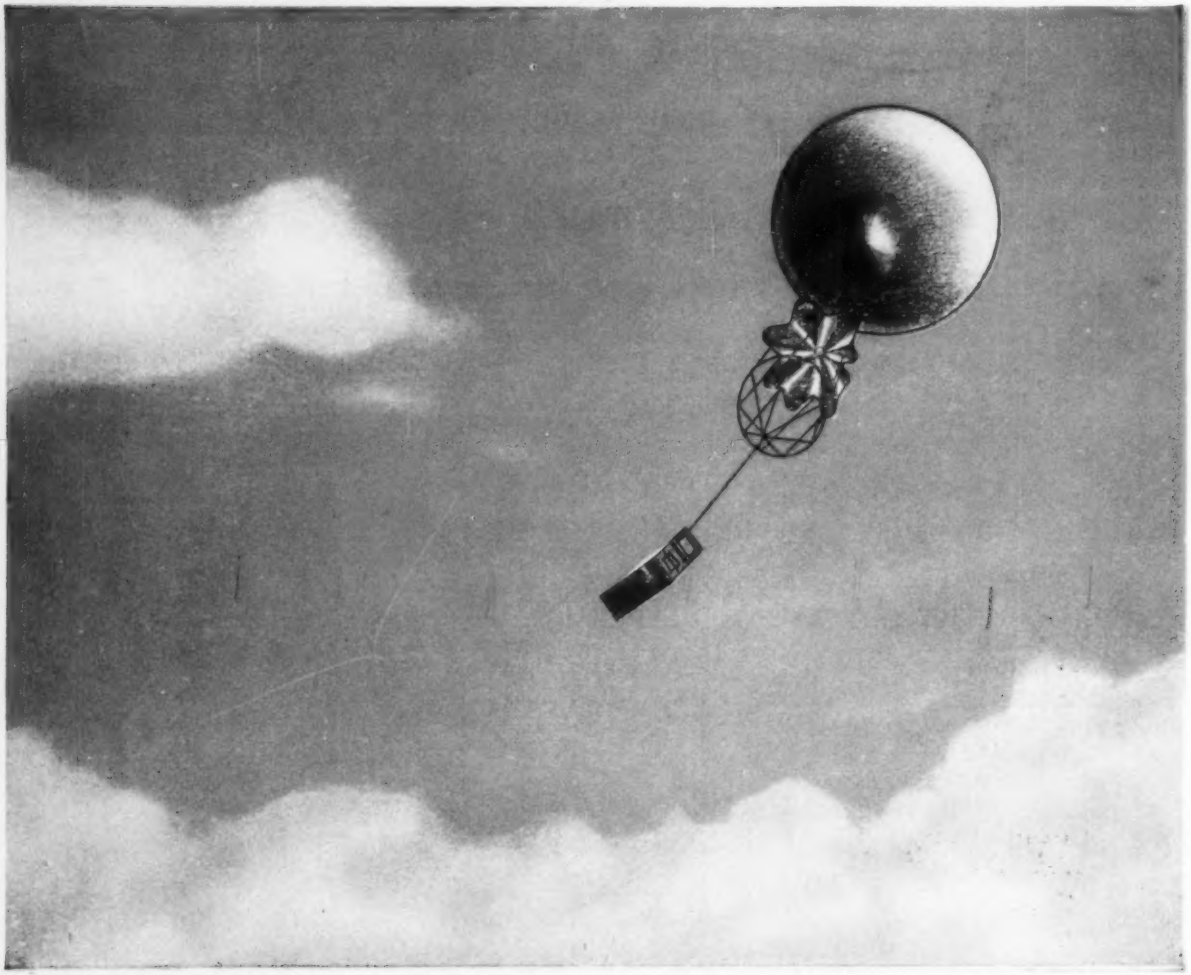

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RUBBER and PLASTICS WEEKLY

Formerly 'Rubber Journal and International Plastics'

Volume 140 *IN ITS 77th YEAR* **No. 17**

April 29 1961

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Rubber and Plastics Weekly 4/61

NOTES of the WEEK

Building for the Future

THE last few months has produced a series of reminders that the next major breakthrough for plastics will be in the building field. When British Industrial Plastics was taken over by Turner and Newall, one of the reasons given was that the combination would be able to exploit the 'considerable scope in structural plastics'. The details of the new Shell centre on the South Bank, released recently, show that plastics have been taken seriously in a wide range of applications. Thermo-Plastics Ltd. and the UAM group have formed a joint subsidiary — Allied Structural Plastics Ltd. — which will combine the plastics knowledge of the one with the building know-how of the other. Within the next two or three years we shall see the commercial development of prefabricated walls with a core of rigid foam for domestic buildings; and eventually it may even be a practical proposition to erect a house in a few days.

Although at the present time an all-plastics house is hardly a practical, and certainly not a financial proposition, some types of building have been produced entirely from plastics, and not as mere curiosities. Last month British Railways erected the first of a number of relay rooms made entirely from plastics. Units consisting of a phenolic foam sandwiched between layers of polyester/glass are bolted together with stiffening flanges of solid polyester. The floor is finished in pvc sheet. In this connexion the plastics house being built by Chemische Werke Hüls at Marl, Western Germany, should be mentioned. This experimental house is a very forward looking venture, and one that UK manufacturers might well copy. New information on this project is published in this issue (page 666).

The Other Side of the Fence

IT is one thing to make the technological advance, however, and quite another to sell it to the architect and builder. In fact, this would be working the wrong way round; the selling and co-operation between the plastics firm and the architect and builder should take place from the moment the idea comes out of the laboratory. This important point is stressed in the special supplement on rubber and plastics in building which appears in this week's issue. The supplement includes articles from an engineer and two architects, who, while they are aware of the great advantages of plastics, speak very refreshingly from the other side of the fence. They point out that any plastics firm wishing to enter the field must be prepared to study not only its technology but also its habits, its long tradition, very carefully. The age of the two industries does make a big difference: architecture can be scarcely less than 7,000 years old; while the commercial plastics industry has scarcely as many days to its credit. Respecting tradition does not mean respecting prejudice, but it does mean that this should be attacked gently — and from a position of knowledge.

An Old-fashioned Box

SPECULATIVE glances into the future are often dangerous. But if polymers are to be developed logically in the building field we must take the long term view. A most lucid glance into the future was made recently by D. G. Keith, senior development officer of I.C.I. Australia and New Zealand Ltd., at the Third National Plastics Convention in Australia.* The standard of domestic building is high in Australia and many new ideas are being put forward. Mr Keith thinks that we are in the grip of a trend which is completely altering the meaning and purpose of buildings. People who possess a car, television set, tape recorder and all the electrical 'near necessities' of modern living are reaching the point where they are investing more in machinery than in the roof over their heads.

'The present dwelling', Mr Keith says, 'is in many senses an old-fashioned box cluttered up with all this apparatus, poorly lit, atrociously insulated and requiring far too much in the way of maintenance'.

He thinks that the house will keep its present external design (apart from the roof — surfaces of complex curvature may be developed) and will be constructed from products which are the result of a 'wedding between inorganic and organic materials'; *e.g.* for the walls, a foam core may be laminated with plasterboard on the inside and asbestos cement on the outside. All-plastic bathrooms and kitchens will be fabricated ready to build into the house.

Needless to say, the story does not end with producing this domed, quickly built house of the future. It has to be sold to the public; the Englishman has to be persuaded that while his house may be his castle, it need not look like one. This, and all other aspects of the subject demand the closest possible co-operation and the interchange of ideas between experts in both fields. It is with this thought in mind that the building supplement in this issue has been prepared. We hope to follow it with a series of articles in which architects and polymer technologists will discuss certain aspects in greater detail.

*Two articles based on this talk appeared in *Australian Plastics and Rubber Journal* December 1960 and January 1961

NEWS *Briefs*

AUSTRIAN POLYPROPYLENE PLANT ON STREAM
UK-HUNGARIAN AGREEMENT SIGNED—BUDAPEST PLANT EXTENDED — PVC KNOW-HOW FOR JAPAN?

●**Iraq** — An Italian firm, SAIPEM (a subsidiary of ENI, the Italian State petroleum organization) has been awarded a contract for the construction of a pipeline to convey natural gas from Rumaila (Basra area) to the new Basra power station. It will also serve a plastics plant when this is constructed. The contract was secured by the Italian firm against British, Czechoslovakian and West German competition.

●**Japan** — Kyushu Chemical Co., a joint concern formed by Shin Nippon Chisso Hiryo KK and Yawata Steel, is to produce pvc at a plant at Tobata. A capacity of 24,000 tons is contemplated, and the firm is said to be entering into negotiations for the purchase of production know-how.

●**Hungary** — Imported machinery worth more than £8m. is to be installed in a new calendering department under construction at the Budapest Rubber Goods Factory. Work on the new plant, which covers an area of more than one acre, should be finished by the end of 1962. The new machine lines will produce reinforced rubber at six times the speed of the old plant, says a Hungarian source.

●**Brazil** — President Quadros has signed a decree giving the Government 'exclusive rights for final purchase and sales operations' of rubber, Brazilian or imported. Sales and purchase transactions will be effected by the Banco de Credito da Amazonas SA. The bank may grant import facilities to companies or consumers accredited by the Rubber Defense Federal Commission under the terms of current legislation on rubber import control.

●**Canada** — The first Canadian company west of Ontario to manufacture polyester resins and other basic material for the reinforced plastics industry will be the newly organized Multi-Chem Products Ltd. The firm is a joint subsidiary of British American Paint Co., Victoria, BC, and Chemical Oil and Resin Co., Toronto. Multi-Chem will produce polyester under the trade name Polychem. Kenneth C. Blakely, manager of Chemical Oil, will be general manager of the new company.

●**United States** — The Goodyear Tire and Rubber Co. has agreed to reopen contract talks with the United Rubber Workers Union to discuss wage increase proposals. This move followed the announcement that Firestone Tire and Rubber Co. granted wage increases of 14½ cents an hour over two years to tyre plant workers, and rises of 7½ cents an hour over two years to non-tyre plant employees.

●**Hungary** — The Board of Trade has released quota details of the Anglo-Hungarian trade agreement signed in Budapest last week, which covers the 12 months to January 26 1962. Under this Hungary will export to the UK various rubber goods to the value of £35,000. The UK will send Hungary rubber tyres and tubes to the value of £30,000 and other rubber manufactures to the value of £20,000. Hungary will also import rubber to the value of £700,000 through UK merchants.

●**United States** — The United States Patent Office has registered 'US Royal' as a trade mark for the complete line of fabrics manufactured by the textile division of United States Rubber Co. The trade mark applies to all industrial, asbestos and wearing apparel fabrics made by the rubber company. The trade mark has been used for many years by the company for products made by its tyre, mechanical and footwear divisions.

●**Canada** — Dunlop Canada Ltd. has won a $300,000 contract to instal rubber linings in a titanium dioxide plant to be built at Tracy, Quebec, for British Titan Products Canada Ltd.

●**Sweden** — The contract for building a £7m. steam cracker for Svenska Esso at Stenungsund in Southern Sweden, has been awarded to the Fluor Corporation of Los Angeles. Work is expected to begin shortly and is due to be completed by mid-1963. Overall design of the plant was undertaken by Esso Research and Engineering.

●**Austria** — A £3m. polypropylene unit at the Danubia-Petrochemie AG complex went on stream this week. It obtains feedstock from the new Schwechat refinery, and has an initial capacity of 5,000 tons. About 80% of Danubia's Sch.90m. capital is held by Montecatini of Milan and Linzer Stickstoffwerke, and the remaining 20% is State-owned.

'Keeps on about a nylon fur, she does — I've heard them barking but I've never actually seen one' — 534

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VIEWS *and* REVIEWS

THE grass always looks greener on the other side of the fence — which perhaps accounts for the attractiveness of foreign technical journals. Their attitude and viewpoints are generally sufficiently different from our own to start new trains of thought.

American Viewpoints

Of course, the rubber industry in Britain is not unaware of the potential impact of atom technology on its processes and products, and a number of British companies already have practical experience in this field. These, in particular, will find a recent American symposium interesting.

Radiations and Rubber

It was an excellent idea of the Akron Rubber Group to hold a symposium on 'Radiation and Rubber', of which a long account is given in *Rubber Age* for March 1961, Vol. 88, No. 6, pp. 1007-1010. There were four speakers: J. W. Born (Goodrich), G. I. Doering (Industrial Nucleonics), T. C. Gregson (Goodyear), and J. W. Liska (Firestone).

Dr Liska spoke first, on the 'ABCs of Radiation', describing the production and properties of beta, gamma, and neutron radiations, and the methods of measuring and defining the dosage units.

Mr Born spoke next, on 'Radiation Deterioration of Elastomers,' dealing with ionization, chemical scission, degradation, and unsaturation. He said that 'molecular rearrangement, *cis-trans* isomerization, and gas evolution resulting from the removal of substituent hydrogen groups can occur, and that radiation-activation of both polymer and oxygen molecules can accelerate oxidation and ozonization'. Irradiation can also cause deterioration in rubber by accelerating stress relaxation by inducing permanent chain scission and, by concurrent cross-linking, bring about compression set of the deformed sample. Compounding may help to protect rubbers but much more research in this field is needed.

Vulcanizing by Radiation

Mr Gregson discussed 'Radiation Vulcanization', which is attractive now because of the possibility in the near future of enormous quantities of cheap fission wastes becoming available. It would seem, theoretically, that vulcanizing through direct carbon-carbon bonds, as irradiation does, would give better quality vulcanizates than the conventional, non-carbon, intermolecular bridges which are more susceptible to oxidative and thermal attack. Yet, he pointed out, 'radiation vulcanizates prepared from general-purpose rubbers are found to be of a somewhat poorer quality than their conventional counterparts', while the opposite is often observed with special-purpose elastomers.

Mr Doering described radiation-measuring instruments and techniques, such as the well-known beta gauge for the measurement and control of the thickness of coatings and its various developments including continuous scanning. A gamma-ray component-analyser has been successfully applied to butadiene-styrene manufacture for controlling the end-point of polymerization.

Rubber-to-Metal Bonding Prospects

In a recent talk to the Ontario Rubber Group at Toronto, also reported in *Rubber Age* for March 1961, p. 1004, W. M. De Crease, supervisor of the Elastomer Section of the Research and Development Department of the Hughson Chemicals Co., prophesied that, in rubber-to-metal bonding, brass-plating will eventually be eliminated and replaced by organic adhesives. It is already on the way out, according to figures he gave, and one-coat adhesives are gaining rapidly.

His predictions for the next five years in this field were: 'the service requirements for rubber-to-metal adhesives will be elevated with particular regard to resistance to high temperatures, corrosive environments, and organic liquids; the range of cure temperatures for processing bonded units will very likely be expanded; bonded castable elastomers and room temperature vulcanization of elastomers to metal will present new challenges'.

Rubber Flooring and Mats

Recent US Patent, No. 2,940,887, assigned to the United States Rubber Co., concerns a flooring material and is especially aimed at the manufacture of floor mats. The mat is said to be harder wearing but more attractive in appearance than the conventional mat.

It consists essentially of a laminate, having two or three layers, though two are enough to meet the general principle: a wear-resisting top layer of high styrene-butadiene composition, and a backing layer which may be of cellular composition. These two layers are passed through the nip of heated laminating rolls to form an uncured laminate which is then surface-printed, dried, and rolled up, ready for cutting into blanks for the final moulding and vulcanizing.

Tyre Cord Fatigue

An interesting point is made in the paper presented by the Fabric Research Laboratories Inc. to the recent Louisville meeting of the ACS Rubber Division, 'previewed' in *Rubber Age* for March 1961, p. 985. It is the result of a two-year research programme on the mechanics of tyre cord fatigue, in which both rayon and nylon cords were studied on test fleets operating under both normal and abusive conditions.

Contrary, says the paper, to previous findings, 'both use-conditions result in a normal, initial-strength loss at early mileage, followed by a long period of almost constant cord-strength at a level of about 80% of the original cord-strength. Hence, it is concluded that cord failure must be "cataclysmic" in nature, possibly reflecting the results of a gradual breakdown in the adhesion between cord and rubber'.

Testing Coated-fabric

Fabric technologists in the rubber industry will be interested in the article by E. W. P. Smith entitled

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

'Rubber-Fabric Testing Procedures' appearing in *Rubber Age* for March 1961, Vol. 88, No. 6, pp. 995-7, which outlines the extensive and severe test programme employed by the Bendix-Westinghouse Automotive Air Brake Co. in investigating new coated-fabrics.

Although the coating cannot always be stripped from the fabric, the specification calls for a minimum of 10lb. per in. width. For tensile strength, a minimum of 250-275psi is required. The coating is chemically characterized, chiefly by flame and odour tests.

Oil-resistance is measured by swelling tests after 70 hours immersion in standard grades of oils, and there is another novel immersion test consisting of exposure to a synthetic, brake-reservoir drainage liquid, composed largely of water with 'complex organic acids'.

Laboratory operational tests submit samples installed in actual units to static and other tests, recording air-flow, leakage, wicking, noise, and creep. Wicking is measured by exposing a die-cut hole to prolonged, 100psi air-pressure, and detecting seepage of air by the frothing or foaming which occurs at the edges of the diaphragm after treatment with 'a leak test solution'.

Resistance to low temperatures specifies that diaphragms must cycle satisfactorily after five hours at −65°C. For coated fabrics to be exposed to heat in service (*e.g.* diaphragms in compressors or engine governors) there is an oven test in which a test diaphragm must cycle satisfactorily, without cracks or other signs of deterioration in the coating, for 600 hours at 200°F.

A 'life-test room' has facilities for simultaneously testing several hundred experimental units for a million cycles at operating pressure. Road tests — which may take up to two years to complete — specify that a unit must operate free from trouble for about 100,000 miles on the road.

German Viewpoints

It is neither rational nor just to call a review of a few items in a single US journal 'American Viewpoints': It is merely a glimpse through a keyhole. Here is the same sort of glimpse at some German ideas.

Self-lubricating Plastics

Some plastics are self-lubricating by nature and others can be made so by the incorporation of certain lubricants. This is the theme of an article by H. H. Reinsch under the title of 'Plastics with Incorporated Lubricants' appearing on pp. 21-4 of *Der Plastverarbeiter* for January 1961, Vol. 12, No. 1.

Incorporated lubricants have obvious advantages, particularly where machinery has to work under special conditions of temperature, pressure, or cleanliness. Early trials to secure these advantages were made by using graphite and molybdenum disulphide.

The Mo S_2 was, in general, better than the graphite, especially for lubricating steel running on plastics. In fact, graphite sometimes deleteriously affected the properties of the plastics. Most of the article is concerned with a proprietary brand of powdered molybdenum disulphide, called 'Molykote'.

It must be remembered that the limiting factor in the use of a plastics material — especially a polyamide — likely to be exposed to friction is not so much its abrasion resistance as its resistance to heat.

The incorporation of molybdenum disulphide also proved advantageous in some processes of manufacturing plastics components; for instance, in making bearings by moulding from powder. It presumably behaved as an internal lubricant facilitating flow.

Nylon with incorporated molybdenum disulphide has proved to be a very good material for making small parts for delicate machines, such as cameras, sewing machines, instruments and the like, as well as for the larger components required for automobile construction and domestic machines.

Although the principle has been applied commercially, chiefly to polyamides, it is also suitable for other plastics like pvc, epoxy resins, acrylates, polyesters, and polystyrene.

Emphasize the Practical

Der Plastverarbeiter for March 1961 is an interesting number. Always practical in its approach, its tone and burden this month was more emphatically practical than ever, from Alfred Riemenschneider's editorial, 'Slogans and Reality', which praised the 9th Conference of the West German Plastics Industry (held in Berlin) for its many-sided practicality, to its own articles, many of which were concerned with constructional work in plastics. Not that theory was belittled: 'knowledge is power' insisted the editorial, and went on to plead for better and more intensive technical education and training.

A quite impressive paper in this issue was the one by Dr W. Schulte-Huermann, of Farbenfabriken Bayer, Leverkusen, about the construction and properties of tanks and chemical containers made of glass-fibre-reinforced polyester resins. Well illustrated (except, as is not uncommon in technical journals, already small diagrammatic graphs were further reduced in size), it dealt first with the selection of the best type of resin and of reinforcer, and then with methods of preparation. This was followed by a discussion of the resistance of these materials to chemicals and of the possible applications in the foodstuffs industry. The article ended with a consideration of the electrostatic charges accumulating on the surface of reinforced polyester containers, and suggestions for reducing the surface resistivity by the incorporation of conductive ingredients.

Another paper in the same issue described one of the several proprietary spraying pistols for simultaneously discharging the accelerated liquid resin and the glass fibre, chopped to a suitable length, and so building up layers on a former. This article, too, is of interest to the craftsman, bringing out a number of practical points, such as the use of rollers for improving the final surface finish.

Craftsmen will also be interested to read the article following which describes the construction of a slide-rule from reinforced polyester resin.

The March 1961 number of *Der Plastverarbeiter* also carries two articles continuing two series, one on the compressed-air formation of plastics films, and the other on the injection moulding of polycarbonates. The remainder of the journal consists chiefly of illustrated accounts of new applications of plastics, especially in the field of constructional work.

CHARLES JENNINGS

Dunlop Invest in Malaya

FINAL AGREEMENT ON KL TYRE PLANT

A £1.4m. project for the production of a wide range of tyres in the Federation of Malaya was announced by the Dunlop Rubber Co. Ltd. this week The company said that final agreement had been reached with the Government of Malaya. (First news of the scheme was released more than a year ago — see *RPW*, March 26 1960.)

The company will establish a factory on a site already acquired at Petaling Jaya, near Kuala Lumpur. It is expected to be completed in about 18 months' time and will produce car, truck, motor-cycle and bicycle tyres. Employment will be provided for around 600 persons.

A new company has been formed in Malaya with a proposed ordinary capital of 12m. Straits dollars (£1.4m.). Initially, 39% of the shares will be offered to the public.

Plantations

Dunlop's rubber plantations in Malaya aggregate 75,000 acres and employ 22,000 workers. There is also a Dunlopillo factory in the Federation which exports to neighbouring countries. In January, it was announced by Dunlop that the first crop of high grade rubber from its £4m. Nigerian plantation project was expected later this year.

Reports at the time the Petaling Jaya project was first announced suggested that it seemed likely that it would meet Malayan demand for tyres, which is about 150,000 car and 50,000 lorry tyres a year. About 400,000 tyres a year were expected to be produced, of which half would be exported.

'Pioneer status' has been granted to Dunlop by the Malayan Government.

Natural Moving

As a result of the reorganization of natural rubber research and development units financed by the Malayan Rubber Fund Board, the London headquarters of the following units are to move to 19 Buckingham Street, Adelphi, London, W.C.2. (Date of the change of address is given in parenthesis.)

London representative, MRFB, E. Jago, OBE. Present address: Market Buildings, Mark Lane, London, E.C.3 (May 6 1961).

The Natural Rubber Producers' Research Association, 19 Fenchurch Street, London, E.C.3 (May 13 1961).

The Natural Rubber Bureau, Market Buildings, Mark Lane, London, E.C.3 (May 6 1961).

Staff of former London Advisory Committee (absorbed in the Natural Rubber Bureau from January 1 1961), Commonwealth Institute, Imperial Institute Road, London, S.W.7 (May 25 1961).

Activity in Malta

A new company set up in Malta is called Malta Synthetics Ltd. It will import nylon and Terylene straight yarn and put it through a crimping process.

Other companies that have already set up plants under the island's industrial development scheme are Jablo Plastics and Dowty Seals. The biggest factory to go into production so far is assembling American Rambler cars. Component parts — including tyres — are being bought from UK firms.

UK Manufacture of Vyrene

PRODUCTION TO BEGIN THIS AUTUMN

PLANS are now said to be well advanced for the UK manufacture of Vyrene, the 'revolutionary new yarn' introduced to Britain for the first time this spring by Lastex Yarn and Lactron Thread, Ltd. of Leicester. Production will begin at its South Wales factory this autumn.

This elastic thread, which, it is claimed, can be spun into incredibly fine counts while retaining remarkable durability and strength, will be manufactured under a licence from the US Rubber Co. Ltd. Lastex Yarn and Lactron Thread is a subsidiary of Dunlop Rubber Co. Ltd. and US Rubber.

At the moment it is being used chiefly in swimwear and foundation garments, but the enormous scope which it offers should ensure a future for it in a much wider range of garments. Tests are already being carried out for its use in many different types of fabric, from men's suiting to the finest laces and lingerie materials.

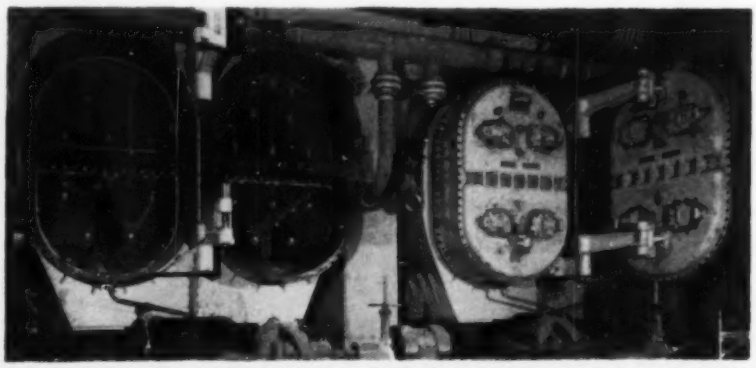
Vyrene has been developed in America, and while for the time being supplies of the yarn are being imported from there, the company says that the garments themselves are entirely British in both design and manufacture.

Vyrene is a monofilament of the linear polyurethane type.

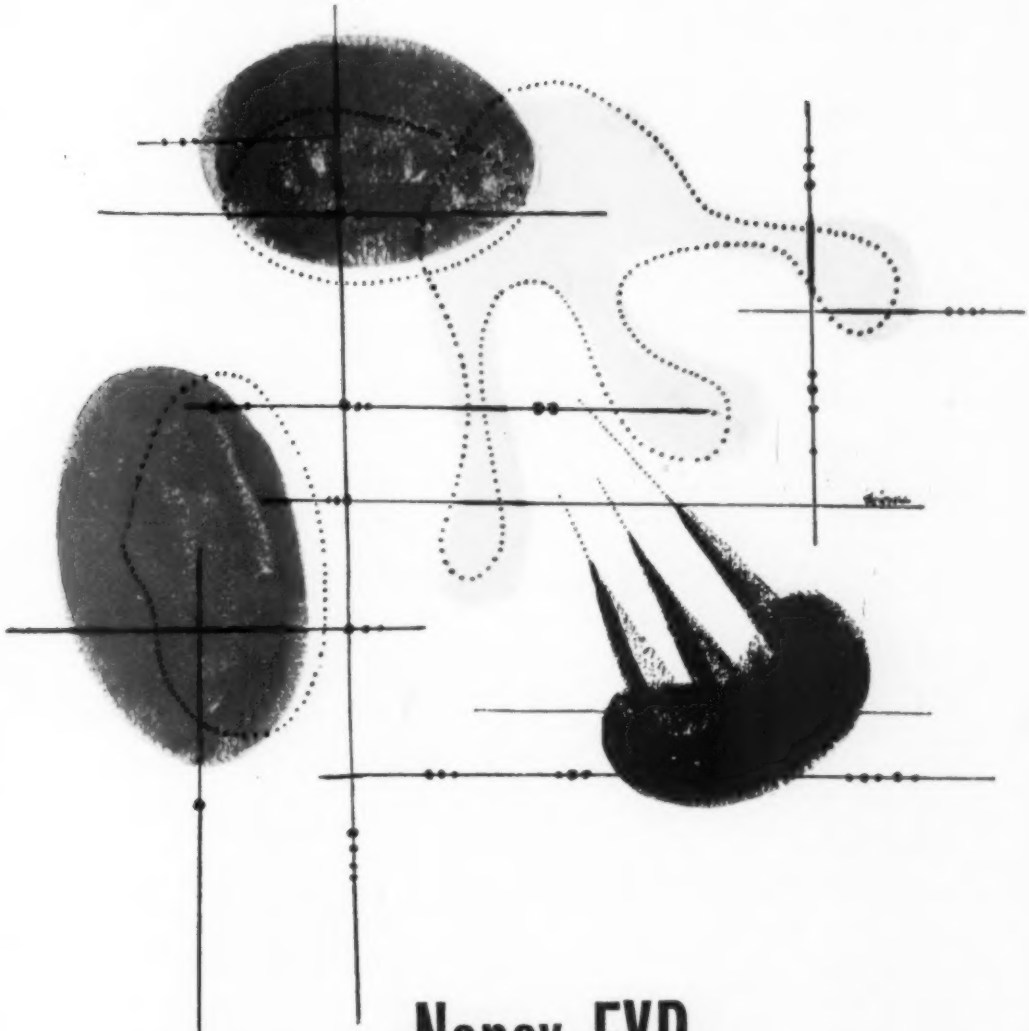
Instron in England

Instron Ltd., American producers of precision testing equipment, has opened its first UK factory at High Wycombe, Bucks. The factory has been established with the full co-operation of the Board of Trade to supply UK, Commonwealth and European markets.

A range of equipment for material testing will be manufactured. Two basic Instron models measure tension, compression, hysteresis and elastic modulus of rubbers and plastics. The range of machines is from 2gm. to 5 tons.



Twin waterboxes and tubeplates of English Electric main condensers installed at Hinkley Point nuclear power station for the Central Electricity Generating Board. They are being coated with a liquid-applied synthetic rubber as protection against severe graphitic corrosion which occurs between the cast-iron box and the brass tube plate when used in seawater cooling systems. Protective Rubber Coatings (Bristol) Ltd., who did pioneer work on the process 15 years ago, has been awarded contracts worth over £150,000 for treating equipment at other nuclear projects



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BPF Needs More Support

DAVID RADFORD URGES ALL MEMBERS TO HELP

MR DAVID RADFORD, the chairman of the British Plastics Federation, speaking at the Federation's annual dinner, said that he wished that the membership of the Federation increased in numbers as rapidly as the attendance at the dinner. He felt that the decision to hold a dinner instead of a luncheon had proved such a success that the function had come to stay.

The principal guest at the BPF dinner was the Rt. Hon. Reginald Maudling, MP *(second from right)*, **seen here chatting with members of the Federation including chairman David Radford** *(extreme right)* **and vice-chairman Finlay Walls** *(centre)*

The dinner, like the first one, was held at the Dorchester and was attended by more than 460 members and their guests.

Mr Radford urged all members to do their utmost to persuade those companies who were not yet members to join.

Two new groups had recently been formed: one to cover the interests of those concerned with the manufacture of wood chip board, and the other to cater for those engaged in the use of plastics for packaging. This, he said, was a comparatively new field but one which was already consuming a large percentage of the production of plastics materials in this country.

Continued Expansion

The plastics industry, continued Mr Radford, was constantly expanding and in 1960 had once again broken all previous records with an increase of over 12% in sales to 561,700 tons, and 19% in production. To absorb this excess production it was evident that greater sales promotion would be necessary both at home and abroad. The fusion of EFTA and EEC was one possible means to this end and a meeting between the plastics trade associations of all the EFTA countries had been arranged by the BPF. Those present were unanimous in their wish to contribute in any way possible to this fusion, and in this respect, said Mr Radford, 'we are fully in agreement with the Government!'

He concluded by mentioning the Interplas exhibition and convention and said that he was sure that it would be as successful this year as it had been in the past and that all members would give the organizers their support. He also expressed the hope that the President of the Board of Trade, the Rt. Hon. Reginald Maudling, MP, who was principal guest at the dinner, would visit the exhibition with members of his staff so that they could see what efforts the Plastics Industry was making to promote trade both at home and overseas.

UK Order for Indian SBR Plant

W. H. Allen Sons and Co. Ltd., Bedford, has gained an order from the Lummus Co. covering the supply of a 750kW. diesel-alternator set to the Bareilly (India) synthetic rubber plant.

The unit consists of a 12-cylinder (vee-form) pressure-charged Allen type VBS12C engine, running at 750rpm and driving a 750kW. Allen alternator suitable for operation on a 3,300-volt, 3-phase, 50-cycle supply, at 0.8 power factor.

The set is to be supplied complete with radiator, air compressors and a control panel for alternator and exciter and will incorporate auto-starting equipment for the diesel engine; with the exception of the panel all equipment will be mounted on a skid-type baseplate.

Modernization at Darwen

INCREASED CAPACITY FOR BLOCK AND PATTERNED PERSPEX

IMPERIAL Chemical Industries is to go ahead with a further stage in the modernization of its Darwen factories, at a cost of £200,000.

It was announced in May 1960 that Orchard factory, where flat Perspex acrylic sheet is made, would be modernized and that the adjacent Parkinsons Mill would be acquired to assist in this. It is now intended to start on the modernization of Britannia Mill. The company says this will enable I.C.I. plastics division's output of patterned and block acrylic to be increased. In addition to alterations to the factory, a new stores building is to be provided and the whole programme will take about a year to complete.

Patterned acrylic is used primarily in lighting fittings, for which there is a growing demand, particularly in the export market, some 80% of the make being shipped overseas. Block acrylic is used in increasing quantities for decorative purposes and for model making, and it also has some important surgical applications.

Early this year I.C.I. announced that acrylic sheet capacity at Wilton, Billingham and Darwen was to be raised to 20,000 tons by 1962. The present capacity is 17,000 tons. Methyl methacrylate monomer production is being geared to this expansion programme.

Harrison Range

A new range of contemporary plastics patterns, said to have found a ready acceptance in architectural use, has been developed by the decorative laminate prints division of Harrison and Sons Ltd. Full colourways will be shown for the first time in a private exhibition at 45 St. Martin's Lane, London, W.C.2, June 20-July 14. The opening of the exhibition has been timed to coincide with the International Plastics Exhibition at Olympia.

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REGAL 300

A NEW low modulus oil furnace black giving rubber properties similar to premium-priced channel black, but with a faster curing rate approaching that of an HAF black.
Its higher tensile strength and elongation, lower modulus and excellent reinforcement coupled with fast cure rate, offer a combination of properties not previously obtained by a single black type.

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A NEW low "structure" fine particle size oil furnace black with the excellent tread-wear resistance of an ISAF type, and giving promise of enhanced cutting and chipping resistance. Regal 600 provides higher tensile strength and elongation than ISAF black together with lower modulus and hardness.

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MEN and MATTERS

A Review of People and Events

by Peter Richards

PUBLIC Relations is called in turn 'a tool of management', 'a necessary evil', 'a waste of time' even 'a racket'. But so much exaggeration is used in arguments both for and against the profession that the really practical work that is carried out is obscured.

If you are sceptical about public relations, or if you are not sure what it could do for your firm, I can recommend a one-day conference, organized by the British Institute of Management, at the Connaught Rooms London, on Tuesday May 16. It will discuss 'Public Relations in Marketing'.

The speakers will include J. Campbell Fraser, Dunlop's PRO. He will speak from the company's point of view. Other speakers will be T. H. Traverse-Healey (Pritchard Wood, for the advertising agency) and Colin Hodgkinson, who will give the point of view of the independent consultant. The speakers will be joined in a question-and-answer session by a representative of a national newspaper, and the day promises to be both lively and worthwhile.

Motorway Education

Last year the Tyre Manufacturers' Conference published two leaflets, one called 'Car Tyres for Fast Motoring' and the other 'Speed and Commercial and Public Service Vehicle Tyres'. The subject is so important that I am glad to learn that posters have been produced. These put into graphic form the advice contained in the leaflets.

They are being distributed to tyre dealers and service stations throughout the country, priority being given to those premises situated on the immediate approaches to the M1, Preston By-Pass and the Ross Spur.

102 Between Them

A presentation ceremony took place recently at Christy and Norris Ltd., of Chelmsford, manufacturers of machinery for granulating plastic sprues and rejects, to mark the retirement of two of its directors.

Combined service to the firm by J. F. Myall, works director, and F. H. Mills, technical sales director, amounted to 102 years. The company, which is probably the oldest established milling engineering concern in the country, celebrated its centenary in 1958.

Royal Visit to Avon

The Duke of Edinburgh made a private visit to the Melksham factory of Avon India Rubber recently. He was there for nearly two hours, inspecting many processes and products, including tyres, printing rollers, aircraft and motor-car components, sports goods and inflatable boats.

Prince Philip was shown the straining and compounding of rubber on Banbury machines, calendering and various tyre building processes.

In the tread shop the Duke inspected the twofold tread running line where high hysteresis 'cling' treads are married to resilient sidewalls to give flexibility and cool running.

An exhibition was erected for the occasion, showing products from all companies within the Avon Group. The Melksham display included rubber brake blocks used in the process of polishing rice grains, high draft cots and bands used in cotton spinning frames, motor cycle racing tyres, a milking machine pail unit with rubber components, a rubber stator for mono pump, and a demonstration of high hysteresis rubber used in the new twofold tyre, Turbospeed Mark II.

Among other members of the group Avon Nairobi displayed cycle tyres made in the Nairobi factory — and by contrast J. W. and T. Connolly showed an ox cart as used in British East Africa.

Framed in a giant tyre is the Duke of Edinburgh, who paid a private visit to Avon's Melksham factory recently. Explaining a point to him is tyre superintendent G. Venton *(see : Royal Visit to Avon)*

Travelling . . .

Spring certainly acts as a fillip to business. With more than just a touch of it in the air, the flow of executives out of England has increased considerably. On the airport lists I have spotted several Vitafoam directors and executives. Frederick Whitehead, sales director, and Fernly Parker, financial director and secretary, have been visiting Holland and Germany with Bernard Batchelor on export business.

Walter Neil and Charles Gleadle, Vitesta Ltd. — Vitafoam's new glass fibre subsidiary — have gone to America to study reinforced plastics technology. Their visit is expected to last a fortnight.

. . . To Scandinavia

A visitor to Scandinavia was Eldon Sandys, managing director of Flexible Ducting Ltd.

He is a great believer in the need for British exporters to take advantage of their favourable competitive position in the European Free Trade Area. He puts forward what is, to me, a very sensible point of view.

'I think there is too great a tendency among many British exporters to bewail the fact that the EFTA market is not as large or as rich as the Common Market', Mr Sandys told me. 'That is true, but until such time as some form of association can

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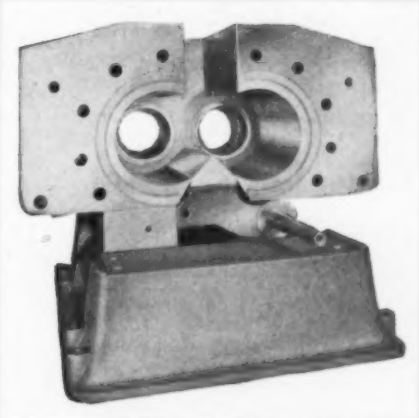
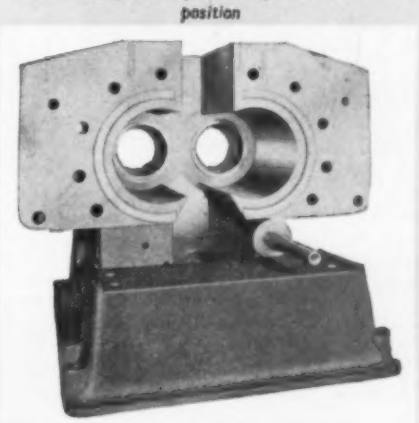
Faster discharge, besides cutting cycle time, is particularly advantageous when formulas require almost instantaneous discharge after pre-determined temperature is reached. With some, a few seconds lag will permit the stock to set up in the mixing chamber.

* ***Banbury is a registered trade mark in many countries throughout the world***



Chamber of Banbury with drop door in closed position



Drop door partially open

Angular view of drop door in open position

Size 11 D-High Pressure high horsepower uni-drive Banbury Mixer with drop type discharge door.

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be effected between the two groups, we must deal with things as they are.

'It would be foolish to ignore good prospects for trade in such markets as Sweden, Norway, Denmark and Switzerland simply because they cannot provide opportunities on the scale possible in, say, Western Germany. My own firm does quite a considerable business in Germany despite tariff differentiation; that is all the more reason to try and expand even more quickly our exports to those countries where the balance is for us rather than against us'.

Dropping Too Many Bricks

The articles in this week's building supplement have some trenchant things to say. One of the points made is that rubber and plastics should

Good idea — bad design

find their own form: designers should not try to copy slavishly the forms used by traditional materials.

A good example of this bad practice is provided by a 'stone-work' panel produced by Cascelloid, vacuum-formed in 52in. by 22in. sheets of pvc.

Cheap dividing walls can be made easily from the material by do-it-yourself enthusiasts. The idea is an excellent one, but why, oh why, does the designer have to reproduce bricks? This olde Englishe rough plastic stoneworke idea is banal and encourages the feeling that plastics are just substitutes. Let us stop imitating and produce more modern designs for modern materials.

Dayton's New President

Pat Barnes has been named president of The Dayton Tire and Rubber Co., now a subsidiary of Firestone Tire. He has been in the tyre business for 30 years.

Polly Ester Says...

'Shelf life — spinster's secret'

THE LEGAL ANGLE

Cost of Disputes

By a Barrister

'Disputes were frequent in earlier times, but the merchant has provided a valuable service in arranging agreed standards for various types of scrap rubber and today such disputes are rare'.—RPW, February 18 1961.

No disputes is sad news for the lawyers who specialize in litigation — but it means a vast saving in costs.

For make no mistake about it: legal disputes are an expensive luxury. How much they will cost depends very much on the circumstances.

Claims for sums up to £400 are generally dealt with in the County Court, where costs are usually lower than in the High Court and cases generally come to trial much quicker. I say 'generally', because it is often possible to bring a case in the High Court, in the hope of getting summary judgment — a cheap and speedy order — even though the amount involved is within the County Court jurisdiction.

If the case reaches trial how much will the action cost?

Bear in mind that the majority of cases do not reach trial; they are settled on the way by people who realize that a reasonable compromise is better than an uncertain victory.

Costs Shoot Upwards

First, you may want Leading Counsel. If you take a Queen's Counsel, you will also have to brief Junior Counsel, a barrister who has not 'taken Silk', who does the preliminary pleading work, assists the Leader, and receives two-thirds of his fee. So if there are Leading Counsel involved, the costs go shooting upwards.

Secondly, how long will the case last? If it's a 'short cause', lasting a matter of a few hours, then each side may incur costs in the High Court as low as £75—but it is doubtful. All will depend on the amount of preliminary work that has been put into the case. If, on the other hand, the case is intricate — there are many witnesses or a great deal of legal complication — it may last for days. And each day may involve legal costs, mounting into hundreds of pounds.

This is all guesswork, of course. In any particular case, you should ask your solicitor what he estimates the costs are likely to be, but do not expect him to give an exact reply. He cannot possibly do so. He may ask you for a payment 'on account of costs', but that is only to cover him against the essentials.

'But if we win, we will be in the clear', you say.

Do Not Fight for 'Principles'

Unfortunately, you are wrong. True, the loser generally has to pay most of the costs of the winner — but very seldom all of them. There are certain 'solicitor and client costs' which a client has to pay to his own solicitor, whatever happens. These are for costs properly incurred but not absolutely essential for the doing of justice between the parties. For instance, you may need to see your Counsel on several occasions in conference. The other party may be forced to pay for one of those visits, but it is doubtful whether he would have to pay for more, even if you won your case — and even if it was the products of these conferences that brought you victory.

The moral? Keep out of litigation if you can. If you cannot, try not to fight for 'principles'. It is litigants who do battle on 'matters of principle' who are splendid clients for lawyers, but who tend to pay heavily for their stubbornness.

There are exceptions, of course . . . and you may be one of them. But if you are about to dive into litigation, remember the time, energy and money you will expend — and think again. Take a good look, before you leap into the legal floods.

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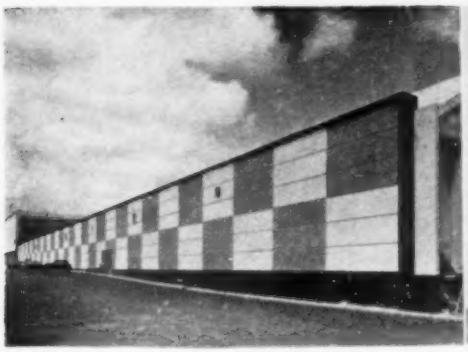
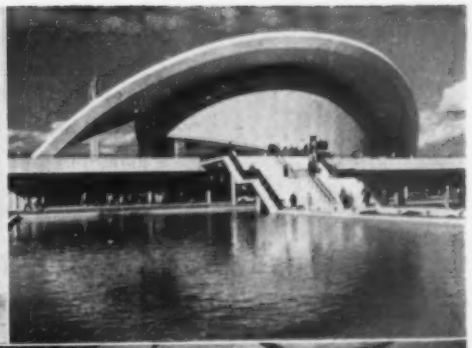
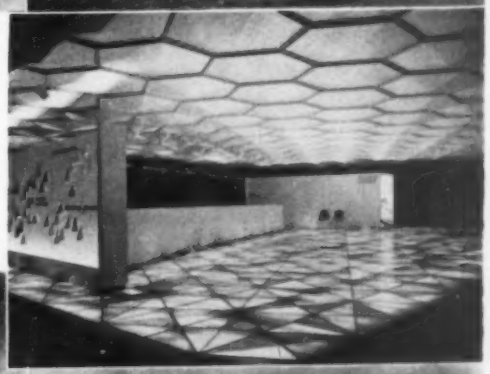


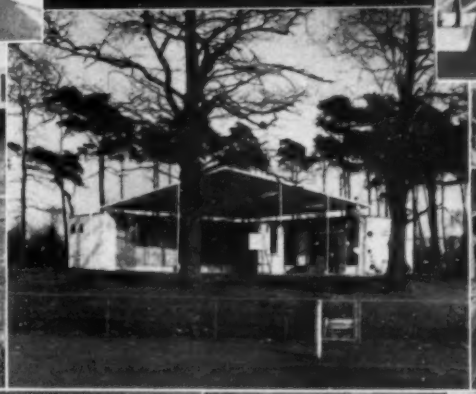


AN RPW SPECIAL FEATURE

Rubber and Plastics in Building

A key to the applications on this page appears on page 648





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RUBBER AND PLASTICS IN BUILDING

Built to Last

SOUND STUDY OF BUILDING SCIENCE NEEDED BY PLASTICS INDUSTRY

By W. F. RATCLIFFE, BSc(Eng.), AMIMechE, Shell International Chemical Co. Ltd.

RECENT weeks have brought news of the great use of plastics in Shell Centre. An event like this comes as a powerful boost to encourage the plastics industry in its endeavours to see its materials more widely accepted by the building industry.

Such schemes occur only once in a while, and this is undoubtedly the first really notable landmark in the UK to record the emergence of plastics as architectural materials on the grand scale.

The importance to the plastics industry of this one project may be far-reaching. For this is more than an unusually large building scheme: it is a prestige building of the first importance using only first class materials and built to last. In no part of this building is there a material whether wood, masonry, steel, plastics or glass, which is not completely fitted for its job. Novelty uses are out and plastics are there on merit alone, and not for the sake of using them.

Hard Convincing

This project has well and truly set the seal of respectability on plastics as building industry materials. It should not be imagined that it was easy to obtain the use of plastics on such a large scale: certainly their use was not achieved simply for the asking because that part of the Shell organization engaged in plastics wanted to see them installed. There was a lot of hard convincing to be done, and a decision to use plastics in an application came not from the plastics side, but from Shell Buildings Ltd. and their architectural advisers and specialist consultants. The sheer magnitude of the project meant that the convincing was that much harder to achieve, and that much better, than for a more normal sized scheme.

Local authorities, too, had to be convinced. Thus, the Folkard 'Polyfusion' system of joining 'Carlona' high density polythene pipes and fittings for the fresh water system was tested and approved by the Metropolitan Water Board: the Lambeth Borough Council likewise checked 'Polyfusion' jointing in the 'Lupolen' low density polythene piping in the sanitation and washroom disposal systems.

Again, Shell Centre is designed to unusually high standards of fire safety and the London County Council, through the London Fire Brigade, have kept a close watch and control over the construction and materials used — and plastics have favourably passed such scrutiny. This should go a long way towards reassuring those in the building industry who are still unsure whether or not plastics are safe to use on considerations of fire risk.

Not the Only Criterion

Of course plastics are combustible, when tested by the very severe procedure of BS 476: Part 1: 1953, and so are very many other widely accepted building materials; but combustibility is not the only criterion by which a material is judged on grounds of fire safety. The general purport of fire safety regulations, insofar as they govern the choice of materials in buildings, is not so much to prohibit the use of materials which burn — for that would rule out too many which have been proved acceptable by long experience — as to exercise some control over the rate at which materials will tend to propagate a fire once it has started. In this respect plastics, in many cases, offer no more risk than traditionally accepted materials.

All in all, Shell Centre should serve to move plastics a little further from being 'interesting possibilities' towards the 'reality, here and now' in the minds of the building industry. Indeed those of us who have worked for the acceptance of plastics on a large scale in Shell Centre hope this will be the case. This does not in any way belittle the work of others in the industry who have also been endeavouring to establish plastics as architectural materials. It so happens that Shell were the lucky ones to have a scheme of such magnitude to work on. It is also true that in some applications plastics were not used at all, or only on a restricted scale, when we would have liked to have seen them widely employed. But in the great majority of applications where plastics have been chosen, they have been installed throughout; certainly not timidly nor tentatively in small trial areas 'to see if they will work'.

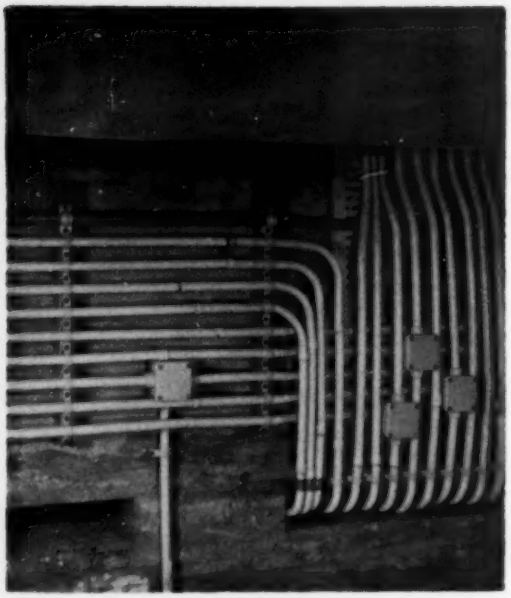
Interceptor fabricated from polythene. Used in the office cleaning disposal system of the Shell Centre

It now remains to be seen how far the impetus of this venture will assist the plastics industry before another such landmark appears. We hope that the influence of the scheme will manifest itself by some increase in the tempo of usage of plastics by the building industry, and that local authorities, in particular, will take note of what has been accomplished and gain confidence in plastics from it.

Terms Show Lack of Knowledge

Against this background of one sizeable achievement, let us consider a few diverse problems which are present, not in any one project, but in schemes in general, for there is a long way to go before large parts of the building industry see plastics in the same rosy light in which the plastics industry sees them. Sometimes the plastics industry describes its own materials in terms which naïvely, if well meaningly, display lack of knowledge of a subject. Acoustics is one such case.

Of all technical subjects, acoustics is perhaps one of the least well understood. Sometimes a plastics material is said to be 'a good acoustic material'. It does not matter what the material is, or what form it takes, but to describe it as 'a good acoustic material' or possessing 'good acoustic properties', might shake the confidence of many building people.



Array of pvc electrical conduit with junction boxes of thermosetting resin used in the Shell refinery and chemical plant at Pernis

Without delving very deeply into the subject we find that acoustics, the study of noise behaviour and defence against it, involves different phenomena, transmission, absorption and reflection of sound, which are present simultaneously. Absorption and reflection are complementary phenomena which need to be controlled by methods quite different than those for controlling transmission. The materials to reduce sound transmission must be massive and solid: those to reduce sound reflection are normally light, limp and porous. Thus a material which is good at cutting down transmission of sound may be no good for reducing reflection. We therefore see that 'a good acoustic material' is a loose expression and meaningless — good in which of two or more opposing ways?

Noise behaviour, too, is a subject which offers pitfalls of terminology. For example, in acoustics, absorption is the mechanism which reduces the amount of sound energy reflected from a surface back into the space in which it originated. Absorption has negligible effect on the energy which, falling on one face of a material, travels through its mass and out of the other side (of, say, a partition) in a new wave system — this mechanism constituting the transmission of sound. One might expect a material which has good absorption properties to offer low transmission, but we have just seen that this is not necessarily so in noise behaviour and defence. Yet many people in plastics mistakenly talk of good absorption properties when they really mean that the material is good for reducing sound transmission.

Answer is a Composite

This last point is not intended to be a miniature treatise on noise behaviour. It is to show plastics people that building science needs to be studied if unconvincing arguments and misapplications are to be avoided when selling to the building industry.

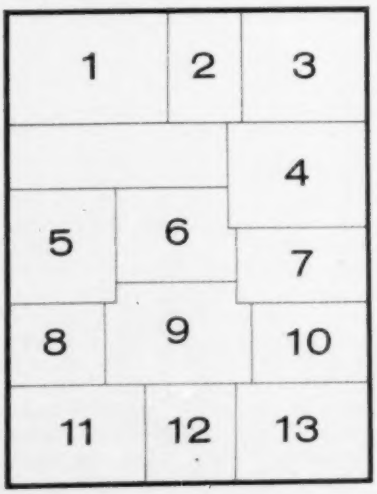
Before leaving acoustics, a hint to those who would try to sell 'a good acoustic material'. Try instead for not just one material but a combination of two or more. We have seen that sound is a combination of mechanisms which require different methods to control them. No single material does this, but the answer should be sought in composite materials. Thus a lightweight plastic may cope with absorption and reflection in the desired way in a given frequency range, and a massive material with a density well above that offered by a plastics should give the desired reduction in sound transmission. Used in composite form in suitable thicknesses plastics and massiveness may together give the desired total result, which neither will give on its own.

The building industry have a good point in wishing to keep the number of different items in their inventories as small as possible. This is in keeping with the philosophy of rationalization and simplification of work which we, as a go-ahead industry, should applaud. For example, some builders prefer not to use polythene pipe for cold water services because the same pipe is not used for the hot water

Extensive use has been made in the Shell Centre of epoxy-based varnishes for coating woodwork

Key to Applications on page 645

1. Textured rubber was used to impart a 'crepe' finish to precast concrete slabs on this factory wall. 2. Lightweight rubber crash doors yield to a little feminine persuasion. 3. The Kongresshalle, West Berlin — venue for rubber and plastics conferences. 4. The BASF stand at the 1959 Plastics Exhibiton in Dusseldorf. 5. Marleycel expanded polystyrene in 12in. square panels lines the ceiling of this office block. 6. Steel and concrete structure sheathed in union carbide vinyl overlooks the airport at Los Angeles. 7. Main stairway of the Shell office building at Pernis showing extruded pvc handrail used extensively in the building. 8. Fablon 500 gauge polythene sheet used to protect the glass during exterior rendering of the Aerial Hotel near London Airport. 9. The plastics house built by Chemische Werke Hüls to test building applications of Hüls materials. 10. Extensive use of Warerite has been made for all shelves, counters and surfaces in this baker's shop at Nuneaton. 11. The Richard Henry salon at Swansea where Warerite has been used for wall coverings and shelf surfaces. 12. The Shell centre makes extensive use of Styrocell expanded polystyrene as a lagging for air conditioning ducts. 13. The infilling panels on these Salford offices are of 1/20in. Marlica on ¼in. resin bonded plywood



services. To use polythene for cold water in addition to a traditional material for hot water would mean holding stocks of two different pipe materials in place of one. By the same token, if polypropylene pipe becomes recognised for domestic hot water services, builders will not wish to stock that and polythene for cold water. Therefore if polypropylene is accepted for hot water pipe we may expect it also to take over a good part of existing markets for polythene domestic cold water piping with a consequent readjustment of polythene markets.

Standards the First Step

The plastics industry is generally aware of the need for having its end-products written into British Standards, and nowhere is this more important than when endeavouring to increase sales of plastics to the building industry. A British Standard, being a statement of agreement between users and manufacturers is often the first significant step in recording the confidence of users in a fairly new material. It is therefore necessary that Standards involving plastics end-products should be good ones, far-seeing and not parochially written too closely round Brand X, but rather keeping an eye on wider possibilities in export markets. It is probably true that many of the smaller builders in particular are interested enough to venture into trial uses of plastics but do not know how to set about specifying sound materials and end-products. If British Standards did that for them, plastics might markedly progress more rapidly into building markets.

Perhaps as important as Standards are Codes of Practice which would set out what consensus of informed opinion considers to be good advice and practice in the use of plastics. The preparation of Codes of Practice ought to be considered by the plastics industry because if information were pooled by those with first hand experience there should, by now, be enough knowledge, if codified, to be directly useful to architects and builders.

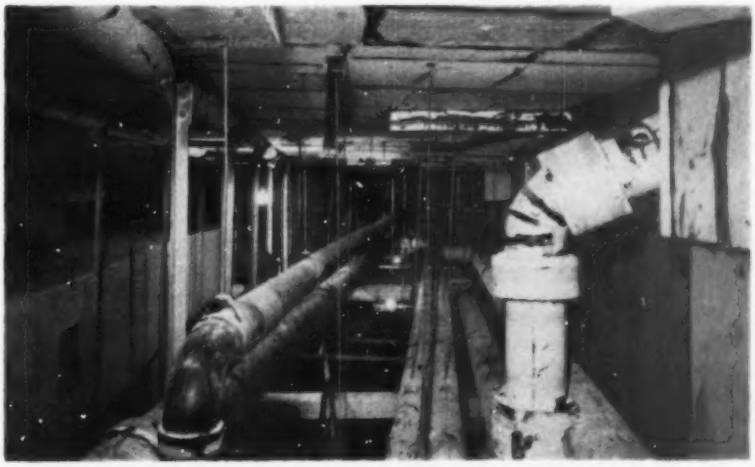
Much has been written and said about the conservative attitude of the building industry taken as a whole. Slowness to change, when prompted by caution, is understandable, up to a point: when prompted by an attitude of hopelessness it is unworthy. So it is with some builders and architects who say, of plastics, that they are too fragile to survive the handling to be expected from the average building site operative and that there is little hope of expecting much change for the better in this respect from building labour. This outlook of despair, or excuse, is, unfortunately, heard too often to be considered isolated.

The reply to such argument is surely to point out that a material must be handled and installed with tools and techniques appropriate to that material, and that the building industry has been doing this for a long time with traditional materials so why try to make plastics an exception? Builders would quickly take action if, for example, they found plate glass being eased into position with such inappropriate instruments as sledge hammers and hob-nailed boots. This may at first sound facetious, but it is a perfectly sound and legitimate argument.

Again, on many building sites there are signs enough of unintentionally broken earthenware or ceramic tiles, drain pipes, breeze blocks, bricks and the like to show that some wastage of materials through breakage is inevitable, and even tolerated. No material is perfect and it is unreasonable to try to hold plastics to an unattainable criterion any more than one would a traditional material.

There are signs, too, that the building industry has not been adequately acquainted with pertinent advances in plastics technology in recent years. This is particularly the case with pvc, where the great improvement in impact strengths from new formulations for unplasticized pvc pipes, quite apart from the rubber modified high impact grades, are very often unknown to builders and architects. It seems that the building industry is still mainly aware of pvc pipe as it was before impact strengths were raised by improved formulations. Indeed, the author was agreeably surprised to see just how much punishment pvc pipe intended for electrical conduit could withstand. A few lengths of conduit were deliberately maltreated on a building site. They were kicked and trampled on by a man wearing heavy boots (not rubber boots), hit with hammers, and run over several times by a heavy lorry having a wheel load of over three tons. The conduit did not fracture and although initially flattened by the lorry it recovered considerably and certainly would have allowed small sized cable to be threaded through. We can be sure that metal conduit of comparable size and duty would not have been flattended any less and most certainly would not have recovered. Such treatment was to satisfy ourselves on a few points following doubts raised on the durability of rigid pvc conduit.

These methods are rough and ready and no more than rule of thumb in terms of scientific value, but they bore out previous thoughts on durability noted during the construction, recently, of the Shell Office Building at Rotterdam.



Extensive use of polystyrene is made for anti-condensation surfaces and for insulating pipework and air-conditioning ducts

In this modern building, rigid pvc conduit of 2mm. wall thickness is laid on a structural concrete floor and held in place by an occasional small mound of concrete which bonds itself to the structural floor. The conduit was exposed for several weeks before being covered by the smooth screed on which the pvc-based floor covering was laid. Damage to the conduit, with no more than customary protection from workmen's boots, wheelbarrows and other tackle, was negligible.

In this country strong doubts have been raised against pvc conduit on the very grounds that when laid on a structural floor it would never survive undamaged the period before screeding. Clearly, conjecture of what might

Continued on page 653

RUBBER AND PLASTICS IN BUILDING

Rubber Fittings and Finishes

CHOSEN TO MEET A VARIETY OF TOUGH CONDITIONS

AS shown elsewhere in this issue, rubber has to face tough conditions in many of the structural uses in building and civil engineering. But, for the oldest of all uses of rubber in buildings — flooring — the 1960s have reserved the cruellest test of all — the stiletto heel! The standard nine-stone typist hurrying from the canteen delivers a thrust of at least 450lb. per sq. in. with each heel combined with impact, abrasion, and a shearing action as she turns. While aircraft designers have had to rethink the structure of airliner flooring and even asphalt pavements have suffered serious damage, the indications are that rubber survives this unforeseen menace better than any other type of flooring. Owing to its inherent resilience, it has proved able to absorb the exceptional stresses without exhibiting any permanent indentation or cracking which have proved all too common with some other types of flooring.

Lion's Share for Flooring

Flooring still consumes by far the largest proportion of the rubber used in connexion with buildings. In the UK alone, the last figures available (for 1959) show consumption at 1,483 tons. The lion's share of this goes into the kind of heavy duty flooring used in banks, offices, and other large public and commercial buildings while a sizeable proportion (60% of one manufacturer's total production) is installed in hospitals. The thickness of the rubber for such requirements is of the order of $\frac{3}{16}$ to $\frac{1}{2}$in. For Lloyds of London's new building, for instance, completed a few years ago, 157 tons of $\frac{1}{2}$in. thick natural rubber flooring were supplied; the area covered including 4,000 sq. yd. in the underwriters' room alone.

Initial cost of installations of this kind are considerably higher than most other types of flooring but it is obviously short-sighted to regard rubber, for this reason, as an 'expensive' flooring material. For example, the rubber flooring in one London bank is still in good condition over 60 years after it was put down, proof enough that when service is taken into account rubber flooring in public buildings can be inexpensive.

Silence Please

For hospitals the sound-absorbent properties of rubber are an important factor. Another factor is the tendency for static electricity to build up due to the warm dry atmosphere and in operating theatres and elsewhere where a spark could cause an explosion, the anti-static variety of rubber flooring is normally specified.

A sign of rising standards of comfort has been the application of rubber flooring over some very extensive areas where, in a previous era, asphalt or paving would have sufficed. Examples are the vast main concourse at Rome Termini Station and the Immigration Hall of London Airport.

Ribbed Rubber

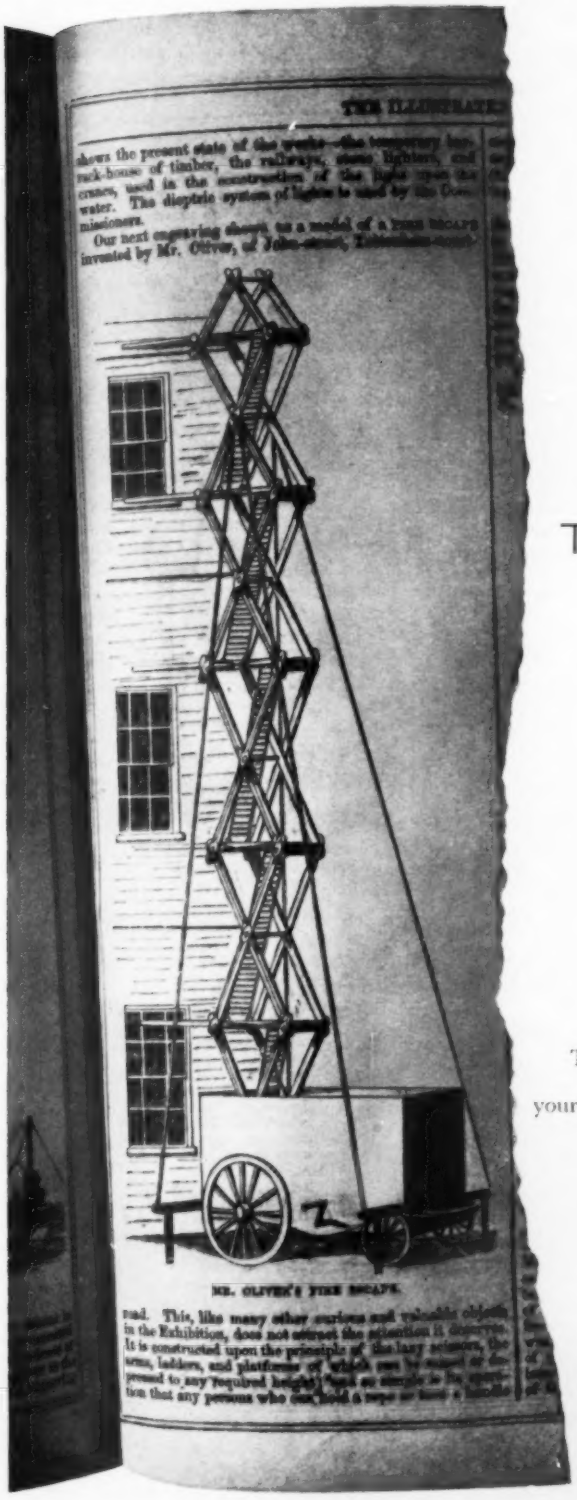
In some more recent public installations where particularly heavy wear, and in some cases weathering, is encountered, such as the busy booking hall at Carlisle Station, a section of open pavement outside the new Pirelli skyscraper in Milan and in the big subway development under the town square in Genoa, a new type of heavy duty ribbed rubber flooring has been employed. This flooring is made up of $\frac{3}{8}$in. thick tiles, ribbed on the top side to prevent slipping and rebated underneath to form a key. In laying these the top screed of the sub-floor is allowed to become almost dry and the rebates filled with neat wet cement before placing the tiles in position. The tiles are thus held down with a vice-like grip when the cement sets and the danger of the adhesive bond between rubber and floor breaking down before the useful life of the rubber is over is eliminated.

Domestic Flooring

In the home, wear is obviously lighter and domestic rubber flooring is normally supplied in $\frac{1}{8}$in. thickness, but, because it is a quality material and relatively expensive, and because the preparation of the base and the adhesion require professional supervision, this outlet is somewhat limited. There are, however, signs that the needs of the do-it-yourself army will be met in future. One manufacturer has recently introduced a form of flooring which is stated to be of natural rubber only 2mm. thick and especially suitable for the amateur to lay. It is claimed that it gives good wear and it is also recommended as an easily cleanable covering for walls and working surfaces.

Nevertheless it is not envisaged that rubber flooring, generally speaking, will ever take more than a minor share of the mass market for flooring materials because it is essentially a quality material. But it is expected to continue to hold its position, by reason of its unequalled resilience, quietness and durability, for installations in public and commercial building where pedestrian traffic is heavy.

The flooring of the Nelson Room in Lloyds new building in Lime Street, City of London, is of rubber tiles made by The Runnymede Rubber Co. Ltd.


shows the present state of the works—the temporary bar-
rack-house of timber, the railways, steam lighters, and
cranes, used in the construction of the light upon the
water. The dioptric system of lights to be used by the Com-
missioners.

Our next engraving shows us a model of a FIRE ESCAPE
invented by Mr. Oliver, of John-street, Tottenham-court-

MR. OLIVER'S FIRE ESCAPE.

road. This, like many other curious and valuable objects
in the Exhibition, does not attract the attention it deserves.
It is constructed upon the principle of the lazy scissors, the
arms, ladders, and platforms of which can be caused or dis-
posed to any required height, and so simple in its construc-
tion that any persons who can hold a rope or hook a ladder

To recover ascendancy in an argument

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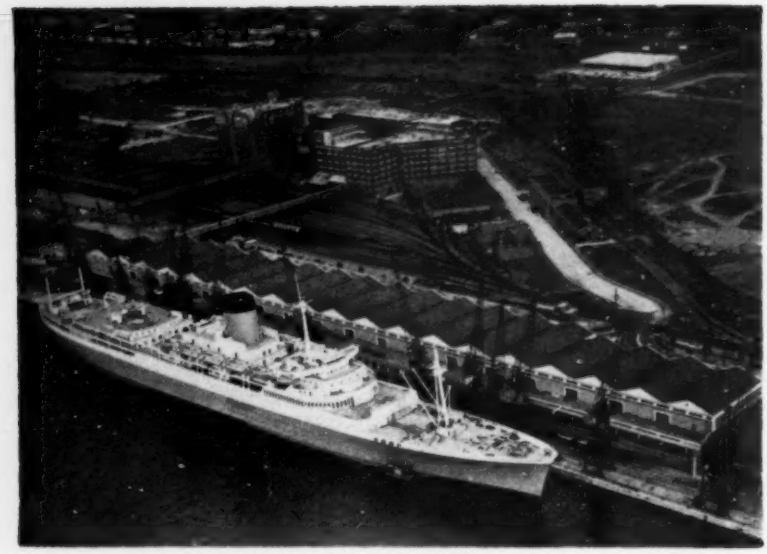


The terminal building of the BTC at Southampton docks is protected with chlorinated rubber paint. This has satisfactorily withstood five years' service despite brine-laden air and railway fumes

By courtesy of Tretol Ltd. and British Transport Commission

Latex Cement

Where possible it has now become common practice to fix rubber floors directly onto latex cement, the addition of latex to the cement imparting a measure of elasticity and improved adhesion. Latex cement helps to make a waterproof seal and for these reasons it also finds applications for jointing between ceramic tiles and between bricks in, for instance, effluent ducts, the floors of dairies, pickling tanks and so on. The powers of adhesion of latex cement are outstanding and it will bond to a wide range of materials. Adhesion to metals is usually a problem but the strength of the bond of latex cement to steel is of the order of 700lb./sq. in. when measured by a direct pull-off test. For this reason it has, incidentally, found considerable application for ships' decking.

Rubber Doors

In spite of rapid mechanization in factories and of factory transport, the humblest employee still scored over the machine in one respect — until a few years ago. He could open and shut doors which was more than a fork-lift truck could do. Nowadays doors are made to suit machines — machines that will not tolerate a moment's delay.

Any motorist who considers how much time he spends in stopping the car to get out and open the drive doors, getting back in again, driving through, stopping, getting out and closing the doors behind him and repeating a similar procedure at his garage will realize how much time is saved in a busy factory by installing drive-through rubber crash doors.

These doors open silently on impact, do not damage the bonnet or sides of the truck, which can change course if need be while passing through, and close automatically. In principle they are simplicity itself and consist of heavy rubber sheets, fitted with Pespex windows, hung on angle-iron frames in such a way that the rubber on the edge furthest from the hinge is free. They are usually hung in pairs in the manner of normal swing doors and opening is a combination of movement on the hinges and flexing of the rubber.

In addition to increasing productivity by aiding the uninterrupted flow of traffic between departments, rubber doors are very effective draught excluders. This is particularly important in plants where processes require an even temperature to be maintained, where the spread of fumes and dust has to be rigorously controlled and full value obtained from the air conditioning.

Industrial crash doors have to withstand continuous buffetings and abrasion but, if properly installed and used, may be expected to give a working life of four to five years or more. In some instances their life has been extended by eliminating impact altogether, the operation of the doors being controlled by a beam of light, push pad, or floor button. One type is fitted with steel studs over the impact area to give protection.

Rubber crash doors caught on rapidly once a few had been installed and proved their merit. At first they were considered suitable mainly for large undertakings, and they were large doors too. Subsequently they have been found useful in any building where there is mechanized transport. The family of crash doors now ranges from giants 15ft. high or more to pigmies of only 2ft. or so for chute entrances. In between are doors for hospitals, canteens and so on, light enough to operate simply by pushing through a trolley or even a tray of tea. There are now a dozen firms marketing rubber crash doors in the UK, and several thousand pairs are produced each year. The makers report a very respectable export market.

Rubberized Paints

Once paint was paint and normally contained white-lead and was oil-

Large-size heavy-duty crash doors made by the Harefield Rubber Co. Ltd. in contrast to those shown on p. 645

based. Now the range and types available seem legion — one builder's catalogue lists over 100 brands. Amongst these are several types of

Wheelbarrow with rubber resin body, in use on a building site. The material used is Dunlop Fortiflex

rubberized paints which command a limited but important sector. Their particular forte is resistance to corrosives.

Of these the most important are the chlorinated rubber paints which are particularly suitable for the protection of steel structures and for use on cement and concrete. The chlorinated rubber is used as an alternative to an oil base and gives superior resistance to acids, alkalis and brine. There is also a type available which is resistant to temperatures down to −60°F., used in cold storage rooms. Chlorinated rubber paints have helped to solve the problem of decorating the asbestos cement sheets which are now increasingly used as a facing on buildings. Weathering of asbestos cement tends to produce a concentration of alkali on the surface derived from the Portland cement contained in the asbestos. This normally causes a standard paint to fail.

At the British Transport Commission's Terminal building at Southampton, which is exposed to a twofold attack — from brine in the amosphere and fumes from the railway — chlorinated rubber paint was applied to the asbestos cement cladding in 1955; it is still in an excellent state of preservation, and has not even faded.

Where a large and rather inaccessible area of a building is exposed to severe weather conditions, particularly where brine is present in the atmosphere, chlorinated rubber-based paint is a 'must', and it is generally used to protect the rather sinister looking spheres of atomic reactors, such as that at Dounreay in Caithness. A manufacturer has recently commented: 'specially formulated chlorinated rubber-based paints are the first choice in "active" areas in view of their known resistance to radiation and ability to be decontaminated'.

More familiar to the householder are the cyclized rubber paints which also give good resistance to corrosives, steam and also oils.

Other Applications

The low thermal conductivity of rubber makes it an excellent insulating material both for keeping heat out of refrigerators and inside homes and offices. Expanded rubber, by virtue of its lightness, is suitable for heat sealing roofs, walls, floor heating systems and for portable containers; while rubberized bitumen, generally associated with roads, is now widely used for waterproofing the interior walls of refrigerating plant and for flat roofs.

It is hoped that this general review in conjunction with the other articles in this issue on building topics, will give some indication of the scope of rubber in the industry.

Even so, it has not been possible to deal with all the ancillary uses of rubber in building such as, for example latex foam for contract seating work, the innumerable forms of rubber ducting for electric wiring without which every structure would be a death trap.

Evidence of the increasing use of rubber in building can be seen even by the layman on any large site. Buckets, hods, wheelbarrows, and cement mixers made of toughened rubber, vacuum suction pumps, hoses, boots and gloves — these are normally considered a write off by the large contractor at the end of the job, but the small builder knows their worth and that with luck he will be able to use them again and again.

We are indebted to the numerous manufacturers of the rubber products referred to on whose information we have drawn. Comprehensive lists of all manufacturers of rubber products for the building industry are available from the Natural Rubber Bureau.

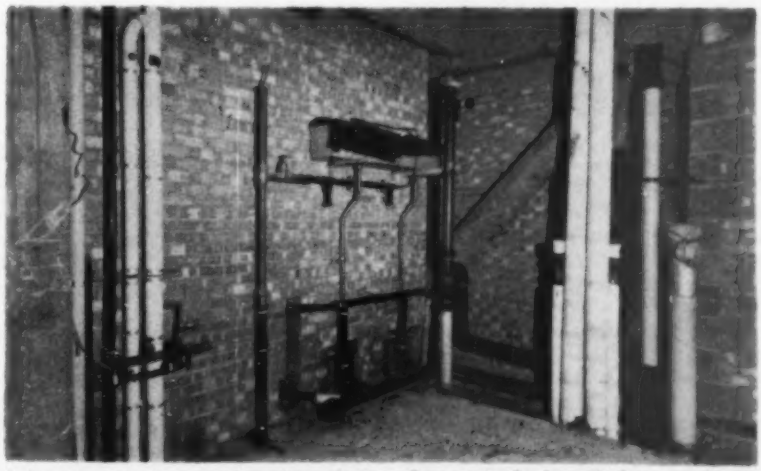
BUILT TO LAST

Continued from page 649

happen is perhaps a less reliable basis for decisions than knowledge of what does happen from actual experience.

The tonnage growth of plastics to the building market is more likely to be steady than spectacular and must surely demand a massive programme of education from us an an industry — firstly getting our own facts right and avoiding pitfalls, then learning every sound argument with which to answer false or uninformed argument, doing everything possible to bring into being Codes of Practice and good Standards for plastics building materials and continually presenting convincing case histories.

Rather than criticize too much the conservative ways of one of our potentially most attractive markets, it is better to recognize the different backgrounds which make the two industries something of an enigma to each other. One has as many centuries to its name as the other has years. One regards several decades as a not unreasonable time in which to assess the suitability of a material: the other needs to test for only a year or two to predict with reasonable probability the suitability during the coming decades. It is the great difference between these rates of acquiring experience which each cannot fully comprehend in the other. Is it too much to hope that pioneering landmarks will help to bring about better understanding?



Soil disposal pipes, anti-syphon pipes and vent stacks in polythene and pvc, some of which are insulated with expanded polystyrene

RUBBER AND PLASTICS IN BUILDING

Plastics Potential

THE ARCHITECT'S VIEWPOINT

By RONALD FIELDING, FRIBA

RATHER than give a list of known uses for plastics in building, I feel that a general appraisal of the subject as a whole will be more enlightening. At the same time, I will try to pinpoint some of the problems which architects and builders meet when considering the possibilities of introducing new materials in their buildings, for I believe that the future uses of plastics will be exciting and much more far-reaching than the present rather limited applications.

It is a known fact that we are all, to some degree, apprehensive of change and experimentation and this attitude is no less apparent in the building industry and professions than elsewhere; thus, to enable the building team to come to quick decisions about, and to appreciate the known and the potential uses of, plastics, much has to be done.

The Test of Time

Quite rightly, a client, having decided to build, will want to know that any material used will stand up to the test of time. Therefore, an architect, in the main, is discouraged from using any material about which he or his clients has doubts, due to inexperience of the material, for which there has not been opportunity for testing over a long period.

Since the client cannot be expected to accept the responsibility for new materials, the architect, in turn, cannot be expected to shoulder the burden of using new and sometimes untried materials and he naturally turns to known and more traditional materials.

It must be remembered that a building is built to last and many people build only once in a lifetime, often investing their savings and mortgaging their earnings to pay for it. It is not surprising, therefore, that we, as architects, are shy of experimentation and of using other people's money to prove a material.

This conservatism is also due, in my opinion, to a lack of awareness of what plastics are and what they can do. To many people, the word plastic indicates cheapness — a substitute — fragility. Minds have been conditioned to what plastics were before and immediately after the war — a means of producing cheap articles and toys, which failed under the slightest strain. This is not the case now and the plastics industry should, with all energy and means available 'tell' the public the story of its materials.

Technical Data

The scarcity of adequate information is a great hindrance to the acceptance of plastics by the architectural profession. When an architect is preparing his design, he wants to have readily available to him a vast amount of data relative to all materials under consideration. This data is sadly lacking in the field of plastics.

What is the information which should be provided by adequate technical literature on any material?

Firstly, the physical as well as the chemical properties; its structural strength; its durability for internal and external use; its insulative properties, both thermal and acoustic; its degree of incombustibility; its compliance or otherwise with the British Standards; the problems associated with future maintenance.

Secondly, the uses to which a particular plastic material can be put; the manufacturing techniques which can be employed; the limiting factors of manufacture, *e.g.* size and thickness and bulk; its availability. We should also want to know what articles are already manufactured as standard items and whether the material is flexible enough to allow of new manufacturing techniques to meet particular design problems posed by the architect.

Cost Factor

Thirdly, and very important, the information sheet should give the cost of such materials and manufactured articles. From personal experience, this is the most elusive information about plastics materials. I have found that, although a plastic material may be initially more expensive than its more conventional or traditional counterpart, the labour costs involved in installation, very often, are much lower. Therefore, information, not only of the cost of the material itself but also of installation, would be a most important item in any information 'hand out'.

This information, in the form of data sheets for architects would be most helpful to the designer; but having himself been convinced, the architect in turn must seek to convince the local authorities and other relevant statutory and, at times, non-statutory bodies, that the material selected complies with all by-law requirements and other regulations.

Public Authorities

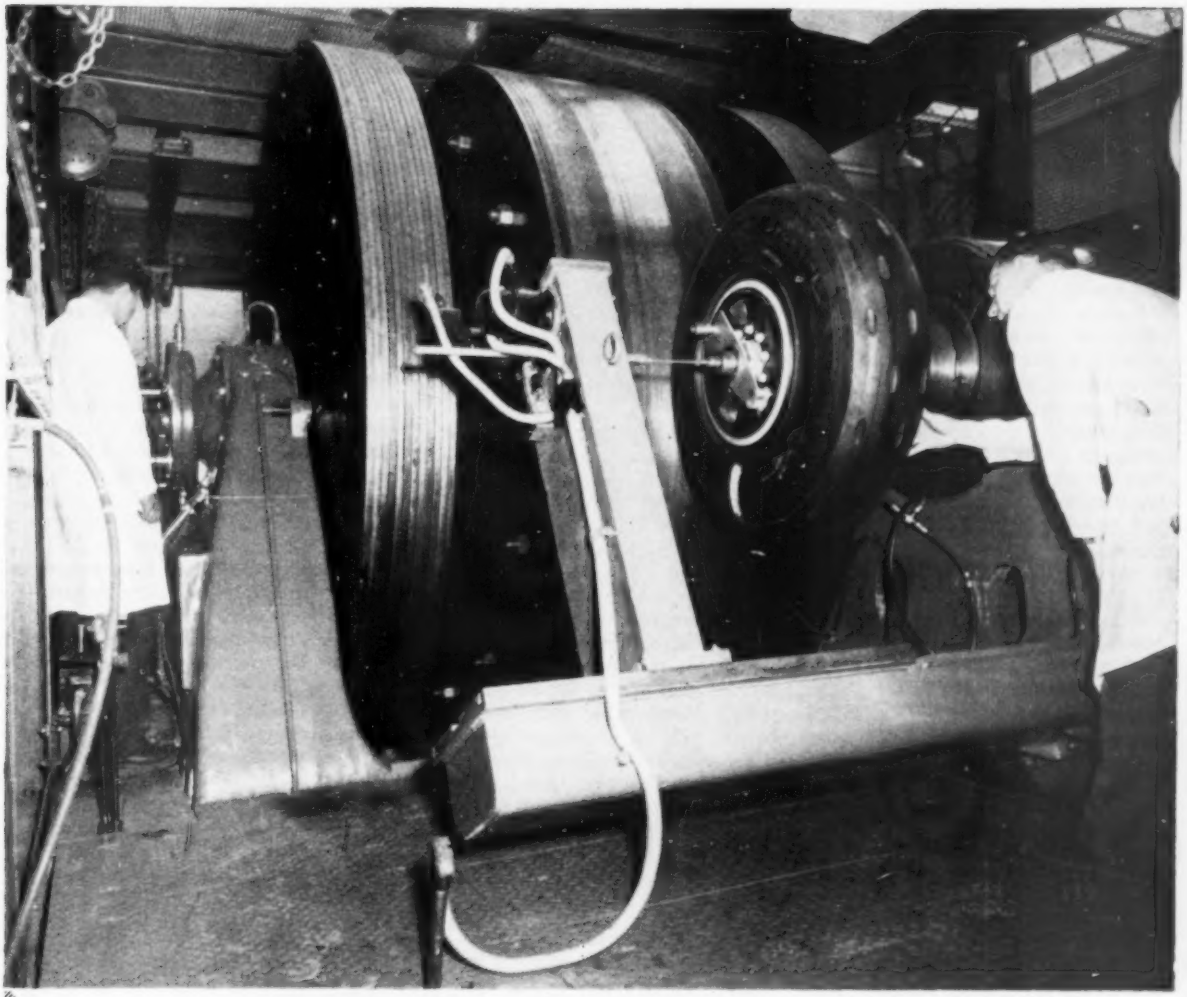
I have found that some water authorities will readily accept plastic pipes, whilst others will reject them. This inconsistency is not only frustrating but is bewildering and I can only suggest that the onus of providing to the various authorities test data and samples and other relevant information must be upon the plastics industry itself. A comprehensive, nation-wide distribution of information and literature to all interested authorities, is necessary to get plastics fully accepted by those whose job it is to approve the architects' methods and choice of materials.

This brings me to the question of how such information can be prepared. The only means, at the moment, for those materials as yet untried in building, is by concentrated laboratory tests. But what is really needed is a programme of field tests to study and learn from materials under normal conditions of use.

Field Tests

The plastics industry is young, energetic and expanding. This expansion means new buildings and plant. Here is the ideal opportunity for experimentation. Let plastics of all types and for all uses, where practicable, be employed in the new factories, laboratories, workshops and office blocks now being erected by and for the plastics industry. For if the industry itself will not experiment — who will? In this way, testing of new materials and methods can be carried out under normal site conditions, which is the only positive way to collect information.

During various recent visits to



This brake and tyre testing equipment at a Dunlop factory incorporates drives and control equipment by 'ENGLISH ELECTRIC' The dynamometer test rig is driven through a clutch and speed reducing gear box by an 'ENGLISH ELECTRIC' Ward-Leonard controlled D.C. motor rated 400 h.p. 1,040 r.p.m. Control of the complete brake test cycle is fully automatic from commencement of the fly-wheel run-up to the point where it is brought to rest by the brake under test.

Publication PS/131, 'Electrical Drives in the Rubber Industry, will be sent on request.

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Holland, I have been immensely impressed by the way in which the Dutch building owners, architects, builders and local authorities have accepted these new materials on a broad front. This is due, in my opinion, to the way in which the plastics industry over there has made the fullest use of their own material in their own new buildings, thus providing the local field for experimenting and testing.

One method of experimentation, which has met with some success in America, is for the plastics industry to build an experimental building, using plastics wherever possible and for it to be open to all those who are interested. In this way, failure of one or more materials would not cause inconvenience and hardship but would lead to further, on the spot, experimentation to discover ways and means of overcoming the cause of failure. The building would not only be a permanent 'testing ground' but would become a 'Plastics in Building' exhibition. In order to give nation-wide coverage to such an experiment, it would be necessary to erect several such buildings in, or near, large towns but I believe the future of plastics in the building industry to be so tremendous, that any expenditure and amount of trouble and effort would be worthwhile.

Training the Builder

May we assume that the client, the architect and the statutory authorities are convinced of the efficiency and practicability of new materials? Then, the building industry, with its shop and site operatives, takes over.

To get a new idea, a new method, a new material accepted into an industry as historically old as building, requires the greatest effort. Therefore, close liaison between the plastics and building industries is of paramount importance, for both interests with a common effort and purpose could explore all new ideas together, each side posing its own problems and solving them to mutual advantage.

There will be operatives to train and a training scheme to cover the greatest number of people engaged upon the installation of plastics is a necessity. Obviously, this could not be done by central training facilities but by sending out trained instructors to demonstrate techniques on site or in the workshop, whenever and wherever any new materials or methods were being used.

Feeling the Way

The need for training is necessary for practical purposes but also to avoid the cost of learning and 'feeling the way', falling upon the building owner. This is illustrated by the fact that the same operation can be more costly when executed by a contractor with no experience, than when carried out by a trained and experienced one.

Seeking Prices

When seeking prices recently for an electrical sub-contract, I required that the various firms should quote alternative prices for steel and plastic conduit. Of the six firms tendering, only one submitted a lower price for the use of plastic conduit. After investigation, I found that only that firm had had previous experience of the material.

So far, I have only mentioned what I feel can be done to engender a more interested and positive approach to future uses of plastics but what has already been, and is now being, done?

Plastics materials and goods of many kinds are being used in buildings today but still in a limited way. Much excellent use is made of hard plastic facing material, of plastic fabrics for wall and ceiling decoration, of expanded plastic for insulation, of plastic based paint and varnish, of plastic pipe and conduit, of plastic light diffusers and of many other limited applications. All have their uses and their problems and all have presented the architect with an unending supply of new materials, which tax anew his ingenuity in design.

Designing for Plastics

But — and I deliberately stress the word — plastics must not be accepted as substitute materials, as is happening in many cases at the moment. There are hard plastic imitation woods, plastic faced materials in mock ceramic tile form, there are fabrics which look like wallpaper. It is totally unnecessary to produce these substitutes — if an architect wants a wood finish, he will use the natural timber; if he wants wallpaper, he will use it; and if he wants wall tiling, he will specify the real thing. Plastics are up-to-date, 20th century materials and they stand on their own; they are selected for what they are and for what they can do. Plastics sell themselves, they do not need to be imitative. Being modern materials, they must be used and designed in a modern way.

There is, I know, another side to the story — I have already been told that this imitation vogue is what the public wants and likes, but I submit that if the imitations were not produced, people would turn to the more sophisticated and up-to-date products, which are more natural to plastics. Just as 'there is no substitute for wool', there is no substitute for wood, glass, ceramics — also plastics — for each has its use and each has its part to play in building. I am not suggesting that plastics will never supplant more traditional building materials, but that they should never imitate.

At the present time only a very small proportion of the total cost of a building is spent in the use of plastics but I venture to suggest that in less than two decades from now, it should be possible to increase the use of plastics up to 60% or more of the total cost of building.

The House of the Future

To crystal gaze is a fascinating and rewarding occupation. It can be fanciful and is often helpful for the future. So let me speculate on the design of buildings in 1980.

Prefabrication is a necessary development of building. Much has been done, but there is a tremendous amount still to be achieved. Prefabrication will be more and more developed, as building costs increase. It will give rise to quicker and therefore cheaper building. It will also absorb less site labour, which is essential in an industry which, if not over-employed, is working to the limit of its capacity and will continue to do so, for building demand is ever present.

So, gazing into the future, as far as plastics are concerned, does presuppose that there will be intense development of prefabrication methods. Then, our building of the future will have roofing units comprising the roof finish welded to an insulation and strong enough structurally in itself to be supported on light framing without a structural slab for support. There can be prefabricated insulative partition units, with various wall finishes already applied. There can be external wall panels with external and internal finishes and insulation, combined with the necessary strength, making unnecessary any structural backing. Kitchen equipment, units, sinks, etc., can be wholly moulded in plastic, as can bathroom sanitary ware. Electrical wiring can be insulated with, and run in conduits of plastic. Cold *and* hot water piping can all be of plastic. Window frames, instead of coated metal can be wholly extruded in plastic. Doors, sills, floors, applied decoration — the list is inexhaustible.

Concrete Construction

Some of these applications are already known and used, others are undergoing development at the moment, but the remainder are only a pipe dream, but then so was reinforced concrete only a few decades ago!

Reinforced concrete! Structural steelwork encased with incombustible concrete! These are long, expensive and labour consuming methods of erecting the skeleton of a building. Does the imagination boggle at the possibilities in this field? Do we peremptorily dismiss such an idea? I am sure not, for it is only by striving for the seemingly impossible, that development in any field can be maintained; and, although the impossible may never be achieved, something else of value may be developed along the line of investigation, such as an aid to the quicker and cheaper erection of concrete, both reinforced and as an incombustible covering to steelwork. This leads me to shuttering and other plant used by builders during erection on site.

Builders' plant is heavy, cumbersome and expensive to move about and erect, due to the weights, sizes and materials involved. This is where plastics may well have, and are having to a limited extent, a beneficial and economical use.

At the moment, plastic film is used a great deal as waterproof membranes and vapour barriers in permanent construction and for temporary protection during the construction period, but there is a need for a much heavier gauge material to withstand the wear and tear of normal building operations.

Shuttering

Shuttering, to which I have already referred is fabricated either on site or in the workshop, using timber or sheet steel, to provide the formwork for concrete in floors, beams, stancheons, staircases, etc. These materials are heavy, difficult to work and expendable and are expensive in material and labour. Some form of heavy duty, hard plastic, which would withstand the vibration of the concrete during its placing into position, could be used to great advantage. It would be easy to work, easy and light to transport and handle and cheap to use.

Many large building sites today use a central batching and mixing plant for concrete, with a pumped supply along pipe lines to various parts of the site. These pipes could be of heavy duty plastic, being lighter, easier to handle, to install and to transport.

Replacing 'Noisy' Materials

Much of the noise from a building in course of erection comes from the mixing and preparation of materials and their movement to various parts of the site. Plastic is a 'quiet' material under impact and therefore could be used to great advantage in replacing other 'noisy' materials used in certain parts of mechanical plant, wheelbarrows and skips, etc.

These are but a few possibilities and I am sure there are many, many others. The field is immense and in need of a great amount of study and investigation.

Close Liaison

I mentioned in the second paragraph of this article that much has to be done. I have suggested what could be done in the future in the sphere of public relations but what of the present? I feel that an immediate response from architects and builders could be obtained through the professional and trades institutes and associations, by means of films, talks and lectures. I am sure also that by encouraging visits, from architects, engineers, surveyors and builders, to plastics factories, research laboratories and workshops, problems on both sides could be discussed and solved at first hand and I am certain that these visits would stimulate a greater interest in plastics for building than at present exists.

Immeasurable Possibilities

During my study of plastics at home and abroad, in laboratories, workshops and factories, I have been greatly impressed by all that is being done in the field of building and how advanced are some of the techniques but I have also been excited and stimulated by the number of potential uses which plastics offer to the designer and builder. The possibilities are immeasurable, the problems are tremendous, and the future is exciting in the Plastics Age. I am convinced that with this new 20th century material, building will see a great change — a change, which for ourselves and posterity, must be successful. It is, therefore, worthwhile for us all to tackle each problem, with all the skill and energy at our disposal, so that the evidence will be there for our successors to know that we made the fullest use of the evolution of new methods and materials.

Polypropylene Supersink

Ekco Plastics Ltd. is producing a 'Supersink', moulded entirely in polypropylene.

The complete unit is of the nominal 42in. x 18in. size, with separately located taps. It will retail at £7 10s.

Rebuilding the River Bank

TO prevent erosion along the banks of the Mississippi, US army engineers are using a 'mat puller' in an operation called revetment construction. This involves the placing of concrete block mattresses — 140ft. wide and 500ft. long — along the river's lower banks.

Equipped with special 'Terra-Tyres', built by the Goodyear Tire and Rubber Co. to 'go anywhere', the mat puller clambers into the water to meet the launching barge that delivers the mattress.

The mattress edge is linked to the mat puller by cable and hooks, and the puller is winched up the river bank until the mattress reaches its designated resting place.

Revetments usually are laid along a bend in the river. Before the mat puller, however, it was impossible to place the square-shaped mattress high enough on the crescent-shaped bank to allow effective bonding with the upper asphalt paving. As revetments continued to fail at the river bends, maintenance costs soared.

The first mat puller was equipped with steel tracks that caused it to break the concrete blocks as it rolled back over them toward the barge after placing the mattress, and also required excessive strain on the winches.

The special tyres, which require only 5-6psi and exert only slightly more pressure than that on the ground, proved to be the answer to both problems.

The 'mat puller', on its special tyres, hauls a concrete block into position

RUBBER AND PLASTICS IN BUILDING

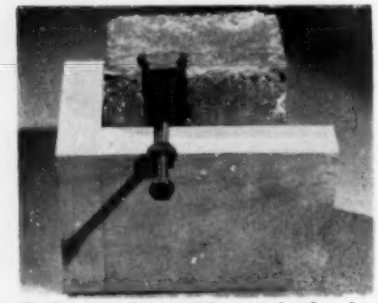
Concrete Construction with Rubber

PNEUMATIC DUCT FORMER SOLVES MANY PROBLEMS

By A. R. SMEE, CBE, MICE
Natural Rubber Bureau

IT is a fairly safe assumption that the first use of rubber by the constructional engineer occurred at some distance from the building site — in the drawing office, in fact, consequent upon the discovery by Joseph Priestley in 1770 that caoutchouc would erase lead pencil marks, a discovery which must have considerably eased the lot of the designer who previously had depended upon bread crumbs for this purpose.

The coming of the rubber hosepipe (first recorded as being used in 1827 at a fire at Fresh Wharf in London) probably served to introduce rubber as a useful material to the building trade and no doubt it created a favourable impression when compared with the leather hoses then in general use.



Wedge section rubber unit for key forming in concrete by Alfex Ltd.

Rubber has now taken its place as a tried, tested and most versatile product which the architect, builder and engineer may employ with the same confidence that they do any of the other materials with which they are traditionally familiar.

Today concrete is the backbone of the majority of the great building projects which are taking shape in all quarters of the globe — the towering massifs of the structures which are altering the skylines of our cities or the dams which serve to hold up countless million gallons of water — and in all of these rubber, with its unique properties, is able to provide valuable assistance to the builder and engineer.

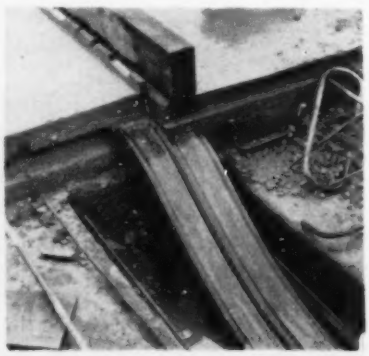
Duct Formers

In most concrete structures provision has to be made for ducts or bores running through the concrete itself. In a bridge these will house the anchorage cables or prestressing wires while in buildings, particularly in the floors, there may be a complexity of such ducts to accommodate the power and lighting cables, telephones, water services and possibly to provide means of heating and ventilation. These ducts or bores must be smooth internally, free from any obstruction or constriction and are not of necessity straight; they may, in fact, have to curve or weave as required and the answer to this problem has proved to be the pneumatic duct former.

Difficult Job Made Easy

In essence it consists of a reinforced rubber tube plugged at one end and fitted at the other end with a tyre valve. In use its application is simple. When the shuttering and steel reinforcement are in position the duct formers are positioned for the service required and inflated to a pressure which will ensure they will not be deformed by the weight of concrete pressing on them. The concrete is then poured round them and, when set, the tube is deflated and withdrawn leaving a perfectly clean cored hole through the mass. A difficult job made easy.

One illustration shows a series of ducts arranged in the floor of a modern house to provide under-floor heating, a constructional method which Roman builders of a bygone age would surely have found of interest.

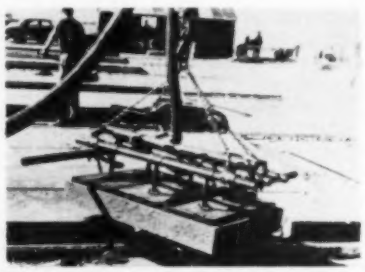


Floor expansion joint by Expandite Ltd. in a Metropolitan Water Board reservoir at Kew Bridge

These pneumatic duct formers normally range in size from ¾in. up to 12in. in diameter and in practice it has been found that from about 150-400ft., according to the diameter, is the maximum length which will permit of their withdrawal. For culverts, sewers, or the like, much larger sizes can be supplied if required and one hydro scheme in Switzerland made use of duct formers of no less than 87in. in diameter.

Vacuum Process

Concrete hardens up fairly slowly after placing and until able to support itself if cast *in situ*, or to stand handling if pre-cast, it must remain in its shuttering or moulds. Any speeding up of the hardening process will therefore show economic advantages by enabling shuttering to be released earlier or by freeing floor space in the curing sheds.



Precast concrete slab about to be positioned with the aid of a vacuum lifting mat

Concrete, if rather on the wet side, is easy to place, it pours readily from the mixer or chute and can be tamped into position in the shuttering or mould with less labour than a stiffer and dryer concrete requires. The disadvantages of an over-wet concrete are slower curing time and reduced maximum strength. The vacuum concrete process has been developed to obviate these drawbacks and speed up the setting of concrete by drawing off the excess water not required for hydration.

The process is a straightforward one. In the case of a pre-cast concrete

Figured rubber sheeting attached to the shuttering is used to produce a pattern on the face of the concrete

panel, this is cast on its face in an open-topped mould, the concrete being poured in, probably vibrated to ensure good consolidation and then screeded to an accurate finish. A sheet of calico, which acts as a filter, is then laid over the face of the wet concrete and on this is placed the vacuum unit which consists of a steel plate faced on the underside with a mat of cellular rubber and edged with a rubber sealing strip. Extraction points are arranged along the upper face of the plate and connected to a vacuum pump which extracts the excess water not required for the hydration of the cement. The operation takes some 15-20 min. and can more than halve the time taken to strike the shuttering or release the concrete from the mould.

The process lends itself particularly to repetition work. It has also proved a great time-saver in laying concrete floors which can be walked over almost immediately after dewatering and, in the case of suspended floors, are self supporting after two days instead of the seven usually allowed.

The power required to operate the section mat is by no means excessive. A 7hp vacuum pump is sufficient for a mat of 50ft. perimeter, which is adequate for most purposes. The largest mat used at present in Great Britain is believed to be 30ft. x 9ft.

Vacuum Lifting

The vacuum mat does not exhaust its range of usefulness by dewatering concrete only. It can also be used for lifting and positioning pre-cast concrete units which, although not fragile, require careful handling and which may not be easy to grip — in a rather lighter sphere of action the vacuum mat is also excellent for lifting large sheets of plate glass.

It is not essential that the object to be lifted should be flat as the vacuum mat can be made up to any desired range of curvature so permitting the mat to be employed for handling items such as large pre-cast concrete pipes, curved sections of concrete roof shells and the like. Loads of up to 50 tons have been handled by this means and it does not appear that this represents the ultimate in lifting capacity.

A piece of equipment which will speed up the setting time of a pre-cast concrete unit and will then, without hooks, slings or ropes, lift it up for positioning as required, must be regarded as a considerable asset to the concrete fabricator.

Anchorages in Concrete

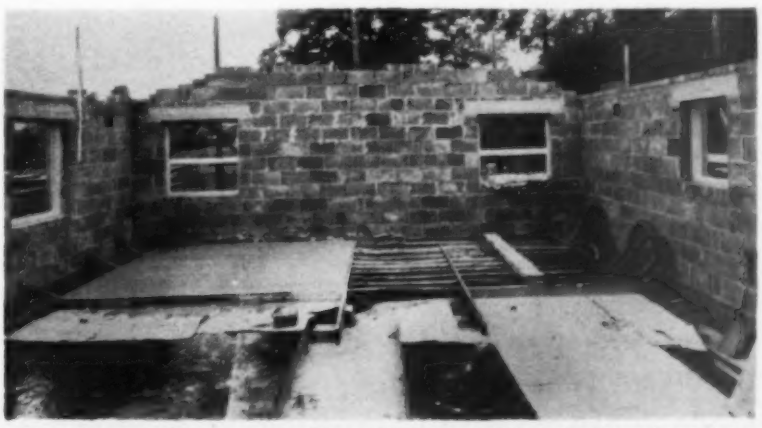
In concrete structures, provision has usually to be made for the attachment of other materials such as timber floors and partitions or perhaps stone facing to the outside of the building itself. Whatever the service required some provision has to be made for means of attachment to the concrete and, as cutting slots in concrete already set is both laborious and expensive, such slots are almost invariably formed during the placing of the concrete.

Timber fillets or slats can be fixed to the inner face of the shuttering and when the shuttering is struck these will leave a perfectly good groove in the concrete but any such groove will of course be parallel-sided as otherwise the fillets could not be withdrawn. To secure a really good anchorage it is desirable that the slots should be fish-tailed, *i.e.*, in appearance like a dovetail joint in a piece of timber and this is possible if special rubber formers are employed. The back and sides of the former are of hard rubber and the core of relatively soft rubber, sufficiently flexible to permit of the whole being squeezed out through the narrow opening when the concrete has set. This may seem a rather trivial use of rubber in a giant building — but it helps the job along.

Jointing

Concrete, like any other material, has its own particular ills and one of these centres round the provision of satisfactory joints. Concrete tends to shrink as part of its water content evaporates during the process of setting and this produces high tensile stresses in the mass which may result in cracking if no provision is made for this movement. Concrete is also subject to expansion and contraction with changes of temperature while in lengthy constructions such as factories, seawalls, dams or the like, some difference in the bearing value of the ground or in the loading of the structure may cause variation in settlement.

To obviate random cracking, joints are arranged to deal with this movement. In buildings covering a large frontage or area the structure may be



Duct formers shown arranged in position to provide under-floor ducts for hot-air heating

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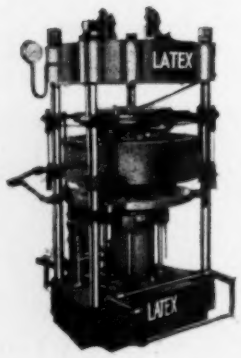

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Inflated rubber tubes held in position by removable steel bridges before the concrete is poured

divided into blocks each separated by unobtrusive and scarcely seen expansion joints, consisting probably of a jointing compound based on rubberized bitumen. With a water retaining structure however such as a reservoir something a good deal more positive is required and the rubber water-stop seems to provide a complete and adequate solution.

Consisting of an extruded rubber strip, shaped somewhat like a dumbbell in cross section, it is embedded between adjacent members of the structure as shown in the illustration of a rubber water-stop used in the construction of a 5m.-gallon balancing-reservoir for the Metropolitan Water Board at Kew, London. The strip is available in any length required and T pieces and three and four way intersections can be provided.

These water-stops can cope with a very considerable degree of movement and still maintain complete watertightness, while accelerated ageing tests by the manufacturers indicate that their useful life will be well in excess of 100 years.

Decorative Finishes

Concrete buildings or other structures may be impressive on account of their size while their design may be such as to create even a feeling of grandeur, but large plain expanses of concrete on factory walls or warehouses are generally rather less decorative. Here again, rubber can befriend the architect and builder as quite attractive finishes can be easily achieved by the simple process of casting the concrete against patterned sheet rubber fixed to the inside of the shuttering.

A variety of patterns is available of course and where large areas are involved a really bold pattern can confer a pleasant appearance to what would otherwise be merely a bleak expanse.

The above examples of the use of rubber in concrete construction covers perforce only a fraction of the thousand and one uses of this most versatile material. Wherever construction goes forward and wherever men and machines are at work rubber will be lending a hand.

Acknowledgements are due to the following to whom the author is indebted for information and/or photographs. Aflex Ltd.; Ductube Ltd.; The Cement and Concrete Association; Expandite Ltd.; Holland and Hannen and Cubitt Ltd.; John Howard and Co.; the London County Council; the Metropolitan Water Board; Millards Machinery Ltd.

PVC Wall Strip

A corner protection strip designed specifically for the protection of external angles of plastered or rendered walls has been added to the Ejecta range of fittings by the Manchester firm James Halstead Ltd., which also makes Poly-Flor vinyl flooring. The corner protection strip is extruded from pvc in a range of eight colours.

A feature of the extruded angle is that the edges are tapered to lie flat against the wall, obviating any sharp protrusions. The strip is manufactured in 50ft. coils.

GRP and Concrete

REINFORCED plastic forming pans are being used exclusively in Canada to create 'waffle' type floor sections — a technique that greatly reduces the cost.

Poured-in-place concrete reinforced with steel rods is still the most economical means of constructing large buildings but it has disadvantages. The major difficulty is that there is a limit to the size of an unsupported floor slab.

This precluded the use of concrete floor slabs in buildings requiring large, unobstructed floor areas, until about twenty years ago when it was suggested that concrete be moulded in a waffle form. With the steel reinforcing concentrated in the webs between the waffle wells, this meant that about 25% of the weight of the slab could be removed without any loss in useful strength.

For some years steel pans were used for moulding the waffle forms but had high initial cost and were very liable to damage in use.

Reinforced plastic forming pans are not only cheaper to use, but more easily handled, thanks to the saving in weight, can be used up to 20 times, and if damaged can easily be repaired. In 1960, it is estimated that about 2m. sq. ft. of buildings were built using plastics pans.

Dual Purpose Ceiling

Expanded polystyrene is being used for a dual purpose in a multi-storey office block at Chiswick designed by Carl Fisher and Associates.

The contractors, Richard Costain Ltd., are using Marleycel polystyrene in 12in. square panels on the top floor to provide an attractive finished ceiling, which, at the same time, gives extremely good insulation. The panels, which are ¾in. thick, are chamfered and stuck to the underside of the roof with a special oil mastic. Altogether 3,870 sq. ft. of ceiling has been finished in this manner.

RUBBER AND PLASTICS IN BUILDING

Outlook of a Local Council

CORRECT DESIGN AN IMPORTANT ASPECT

By HAROLD G. STANTIALL, ARIBA and G. R. AYTO

H. G. Stantiall is Materials Officer to the London County Council Architect's department, and Mr Ayto is one of his staff. He directs the Materials and Information Section of the department, which makes arrangements with the Council's Chief Officer of Supplies for the provision of direct supply materials and components, provides technical advice, and, among many other activities, prepares a monthly Bulletin for the Development and Materials Committee under the chairmanship of the Architect, Mr Hubert Bennett, FRIBA. Mr Stantiall writes this article in his private capacity

IT is the intention of this article to review, in so far as it affects one large local authority, the use of rubber and plastics in building, and the benefits to be derived from them. The details that follow are an appreciation of the use of rubber and plastics in housing and schools, and while no analysis of the incidence of such use has yet been carried out, there is not the slightest doubt that it is on the increase.

For rubber and plastics to find a place in building they must, when being considered for any particular application, satisfy the fundamental requirement of suitability. Any other properties they may possess would serve to strengthen the recommendation for their use, but they could not expect to replace more traditional materials unless they were at least as suitable, taking into consideration such additional factors as cost, durability and particularly design.

Exhaustive Testing

Having all this in mind, the authority has always given full and careful consideration to the use of new materials in its constructional programmes. The procedure is to subject any such new material to laboratory examination, aimed at ascertaining its suitability for any specific use, and in the event of the results being satisfactory, a field trial is then initiated. If, at the end of a suitably prolonged trial, the material is adjudged to be fully satisfactory for its intended use, it is allowed to take its place beside more traditional materials, and compete with them.

In this way many new materials, mainly plastics, are being used, and temporarily omitting paints based on polymers and copolymers, probably the greatest use at present is that of expanded polystyrene sheet. This product is being used principally as the thermal and impact sound insulating layer in concrete floating floor construction where electrical floor heating is employed. Here, provided the maximum temperatures involved cannot, even under the most adverse conditions, exceed the distortion temperature of expanded polystyrene, such use is perfectly safe. Reliable thermal insulation is obtained *i.e.* theoretical and practical figures are in close agreement, and impact sound insulation is Grade I, as tests by the Building Research Station have shown.

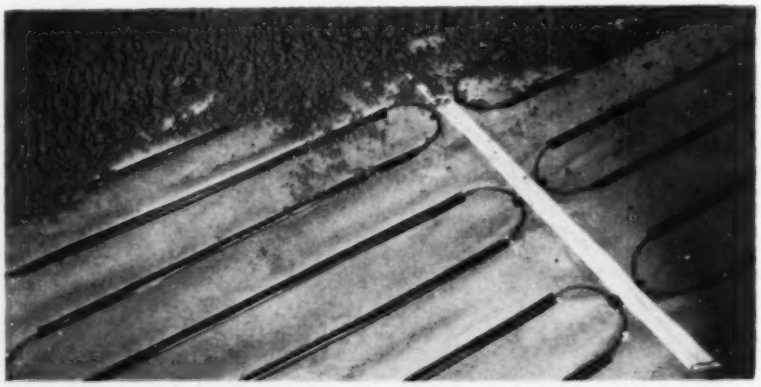
As regards the latter property, expanded polystyrene in its normal condition could not be expected to provide it, but it can be modified so as to do so by compressing the normal material (density 1-1½lb./cu. ft.) to about half its original thickness and allowing it to recover, which it does to more than 90%. After this treatment the material is considerably more resilient, with little or no impairment of its thermal insulation properties, and does all that is required of it in sound insulated heated floor construction. This treated material is thermally more satisfactory than the simple mineral wool and glass wool type of insulating quilt, and about equal acoustically; it is also cheaper, at the time of writing, than the specialized forms of mineral wool and glass wool insulants that would be needed to give the same results.

Thermal Insulation

Expanded polystyrene has also been used, satisfactorily though not very extensively as yet, as the thermal insulating lagging for cold water storage cisterns. It will not, however, replace the normal insulating jacket for hot water tanks or cylinders, as a trial installation showed that it was possible for the water temperature to exceed the distortion temperature of expanded polystyrene.

Ordinary polystyrene is being used, in the form of mouldings, for lighting fittings such as egg-crate grilles, where the accuracy of shape, permanent self-colour and light weight are advantages over painted metal. Its use is best confined to situations such as this, where it is not readily accessible, as it is fairly easily broken.

In the sanitary field the use of polythene ball floats and all-polythene internal syphon mechanisms of water waste preventers is proving to be of benefit, both financially and practically, as compared with the use of their metal counterparts. Polythene should also be better from the maintenance aspect, as there is no corrosion problem. Low density polythene tube has been used for cold water services; while it is satisfactory from the point of view of reducing damage by frost, it is considered that



First layer of screed being laid over a pvc mat to which the cables for an underfloor heating system are attached

there is scope for the production of a really sound, simple inconspicuous method of jointing. There is a tendency for some of the compression systems to 'pull' at the joints.

Hot Water Services

There is no intention at present of using high density polythene for hot water services, as apart from the deformation caused by softening, the higher temperature range considerably increases the oxidation rate of polythene, with very undesirable results. It is, however, being used for waste pipes in school chemistry laboratories where, with associated fittings such as traps and receivers, also in polythene, it is proving successful, and is not affected by the occasional passage of hot water through it.

The development of all-plastics ball-valve units offers, amongst other things, a solution to the vexed problem of corrosion arising in galvanized iron cold-water storage cisterns. In areas where the mains water is cuprosolvent it would be a further advantage for an all-plastics cold-water storage cistern to be available for use with copper pipes, provided it was reasonably priced, and it would be an additional advantage for this cistern to have a tight-fitting lid.

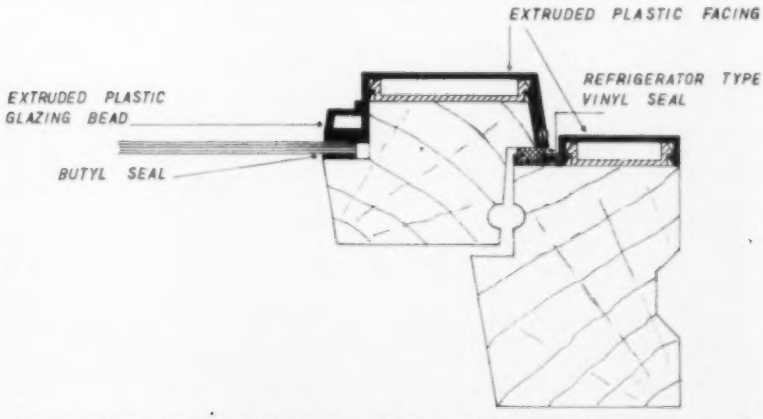
Tank Liner

A very interesting development, from a maintenance point of view, is that of a plastics bag, intended for use as a liner for defective cold-water storage cisterns, or similar installations. A wide range of sizes is available to fit standard cisterns, non-standard sizes being made to order, and the cost is less than half that of galvanized iron cisterns. Apart from its use in maintenance, such a plastics liner could be installed in new metal cisterns, where the effect would be to retain them in a new condition. The plastics liner would also be easily replaceable.

Mosaic produced by sticking wood blocks to a board with polyester resin, which also fills the interstices between the blocks. The whole is then sanded flat and polished

The use of plastics in bath, basin and sink manufacture has been very carefully investigated, and it must be admitted that, from the aspect of their use by local authorities, articles of this kind made from acrylic resins or polyester resin bonded glass fibre would not appear to offer any long-term advantages. The initial slight saving in cost would soon be offset by maintenance expenses, since there is a tendency for people to remove dirt and scum with harsh scouring powders which causes surface scratching and increases dirt retention. This gives rise to a vicious circle of scouring which, particularly in the case of polyester glass, soon renders the surface unserviceable. It seems to us that this is a case where plastics are being put to an unsuitable use and can bring the industry into disrepute.

Practical trials are about to be carried out on acrylic resin baths, as it is felt that these articles may not be quite so vulnerable to the defacement described above, by virtue of the nature of their use. If this should prove to be the case, some benefit could be expected to be derived from their use, both by the owners in the form of reduced maintenance costs due to the absence of chipping and grazing, and to the user in the form of less hot water being necessary to fill them with water at a comfortable temperature, and slower cooling, apart from more obvious advantages of retention of colour and ease of cleaning. A particular advantage, especially in the case of elderly people, is that a fall in a plastics bath is likely to be less harmful than one in a cast iron bath. It is thought, however, acrylic resin will not be suitable for bath manufacture and it is certainly not competitive with cast iron at the moment.



Constructional details of Woodplast windows made by Tensile Products Ltd. This design incorporates a butyl-rubber seal retaining the glazing, a vinyl contact seal and extruded facings

External Applications

The idea of using plastics externally has been the subject of much investigation, for rainwater goods, roof lights, canopies, cladding panels, and the like. Tests of rainwater goods have shown, in the laboratory, that fairly rigid — *i.e.* partially plasticized — polyvinyl chloride is a suitable material, particularly for down pipes; polyester glass is also suitable, particularly for gutters. Practical trials have verified these conclusions, and although the overall cost of fitting all types of rainwater goods (including the traditional metal pipes used as a control), a slight saving in time was experienced in fitting plastics pipes because of the longer lengths involved, and the saving of a joint.

In one type the use of a loose pipe connector was an advantage for using short lengths of down pipe if required, and in another the use of plastics coated metal brackets and clips was an improvement on the

corresponding items in plastics and metal from the aspects of strength and corrosion resistance respectively.

Plastics down pipes and gutters are available in a fair range of colours which are retained reasonably well on weathering, and the materials themselves are capable of resisting the effects of mishandling better than some of their metal counterparts. A comment here that would not be out of place is that a number of plastics rainwater goods have resembled the corresponding components in cast iron; this is considered objectionable, and architects would much prefer to see plastics used with designs expressing the feel and character of the material itself.

A final point in connexion with plastics rainwater goods is that the grade of plastics used should be capable of remaining serviceable over the whole range of outdoor temperatures ever likely to be encountered in this country, particularly low temperatures, as instances of the use of grades that become brittle and easily fractured when cold have been noted.

Reinforced Materials

Roof lights and dome lights in translucent polyester glass have proved themselves to be quite satisfactory in practice, provided they are fixed in accordance with certain stringent requirements when used in the London area, and also provided that they have passed the tests described in BS 476: Part 3:1958 'External fire exposure roof tests'. They are particularly useful in situations where impact damage is likely to occur, and an interesting application recently was in a 140ft. long canopy, projecting 10ft. from the face of a seven-storey block of maisonettes, the purpose of which was to protect the ground floor shopping area. An 8oz. grade of flat sheet polyester resin-bonded glass fibre, suitably supported at 2ft. 6in. centres across the narrow way of the sheet, was subjected to test, and as a result was adjudged to be a suitable substitute for ¼in. wired rough cast glass, and the benefits that may be derived from its use are self-evident. In passing it may be mentioned that it was decided to use a self-extinguishing grade in this canopy to keep the fire hazard to a minimum.

Cladding panels such as melamine surfaced decorative phenolic laminates were investigated, and although their surfaces were not affected by the artificial weathering to which they were subjected, they were not proceeded with in view of their tendency to curl and come away from the plywood base to which they were bonded. Coloured polyester resin-bonded glass fibre sheet, textured by casting it against figured rolled window glass, has been used successfully in place of coloured glass panels which had been used as cladding at the base of external walls and which were being broken by kicking. The coloured glass in this particular case was dearer than the polyester resin-bonded glass fibre sheet, so that not only was a maintenance saving effected by using the plastics alternative, but an immediate saving on cost of reinstatement was also obtained.

Flooring

Flooring is an ever-present problem, and in housing ordinary asphaltic thermoplastic tiles are largely used. At least one manufacturer has now produced a 'vinylized' version of these tiles, every bit as good in performance, with better resistant to certain common reagents, and competitive in price, though somewhat restricted in colour range at present. Where it is desired to use an impervious flooring without joints through which water could seep, sheet polyvinyl chloride, with hot gas welded joints, has been used successfully. In another installation where a colourful floor was required, quiet underfoot and completely non-dusting, rubber tiles were used, again with completely satisfactory results.

Working Surfaces

For work-tops and similar surfaces, such as table tops, the melamine surfaced decorative phenolic laminates are widely used, and it is possible here to effect an economy, without sacrificing quality, by using resin-bonded chipboards surfaced at works with melamine coated decorative papers, suitably balanced to prevent distortion. The colour range and patterns of some of these products is somewhat restricted and unimaginative, and there is considerable room for improvement in these respects.

In the hardware field less use is made of plastics than one would imagine, and this is largely due to the fact that the reasonably priced mouldings, such as door handles and roses, are so readily broken that it is cheaper to use aluminium alloys for such fittings, the plastics coated metal articles being far too expensive. Key boxes, with screw-on fronts that cannot be removed without breaking a glass panel, all moulded from black phenol formaldehyde, have proved to be very efficient and less expensive than the wooden boxes they replaced, and are now a standard fitting in many jobs.

Rubber Applications

The use of rubber in building, apart from flooring, is somewhat specialized and largely revolves round its use in sound insulation, a purpose for which its natural resilience particularly recommends it. For example, in maintenance work, existing heavy concrete floors may have their impact sound insulation value raised to Grade I by the use of thin sheet rubber on a sponge rubber underlay. This treatment would be immeasurably cheaper than attempting to impose a floating floor on top of the existing concrete floor. Anti-vibration mountings, whether specially designed pads, mats or bonded rubber/metal, are all capable of effectively and inexpensively isolating vibrating plant and machinery from the structure in which they are housed, almost without limit to the size and weight of such equipment. Noise transmitted along water pipes may be reduced considerably by inserting a short length (say 6in.-12in.) of suitable rubber pipe in the

An unusual application of polyester resin for decorative purposes is shown in this 300sq.ft. mural which was produced by incising the design on chipboard panels. The incisions were then filled with pigmented resins and, except for polishing, no further treatment was required

Expanded polystyrene sheeting laid over a floor - heating system has good sound-impact insulating properties

system as close to the source of noise as possible. Canvas-covered rubber tube and sponge rubber strip are very effective for sealing between mating surfaces in the sound-proofing of doors, windows and partitions.

Synthetic Adhesives

Synthetic adhesives, particularly the weather- and boil-proof types, offer great advantages over more traditional adhesives, and have greatly increased the possibilities of the structural use of timber. Their use in exterior quality plywood is of considerable benefit, but although they are resistant to fungal attack themselves, they do not protect the wood to any extent, and it must, therefore, be treated to prevent such damage. Synthetic pastes for wallpapering based on sodium carboxy methyl cellulose have the advantage that they do not stain the paper, have good slip, and are not affected by mould growths, and may be used for sizing the wall surface prior to papering. Such pastes should comply with BS 3046:1958 'Paper hanging pastes and powders'.

Paints and Coatings

Surface coatings based on synthetic media are too numerous to discuss in any detail, but at least four types, the use of each of which has certain advantages, may be mentioned. Chlorinated rubber paint is most suitable for direct application to external concrete, asbestos cement products and similar alkaline surfaces without the need for any special anti-alkali primers. It is, for example, very suitable for application to the insides of concrete swimming pools, and is available in the full colour range of BS 2660:1955 'Colours for building and decorative paints'.

Good quality emulsion paints, based on polyvinyl acetate, or co-polymerized vinyl caprate and maleate, are able to bear repeated washing and resist the effects of condensation very well.

A polyurethane based white enamel, specially prepared for renovating defective porcelain enamel baths, has been investigated and has produced excellent results. Clear tinted coatings, based on alkyd resins, have been produced for the *in situ* treatment of window glass to reduce heat transmission, glare and fading. Such treatment has been found to be very satisfactory in practice and is carried out at about a third of the cost of re-glazing with special integrally tinted glasses.

Sealing Compounds

The effective sealing of joints in cladding panels, and the bedding of in-fill panels, calls for mastics with properties over and above those of the conventional castor oil based types.

Sealing compounds based on polythene, butyl rubber and polysulphide rubber are now available, and each in their way are very effective in use. Those based on polysulphide rubber are particularly efficient, but are so expensive that their use is normally only justified if sealants based on polythene or butyl rubber are not adequate.

In conclusion, two comments, based on observations over many years, are offered as being of particular interest to manufacturers.

The first is that many materials, and articles made from them, are put forward and are found to contravene building by-laws, sanitary by-laws and other regulations. Much time and expense would have been spared if enquiries as to compliance with such by-laws and regulations had been made beforehand.

The second comment is that many functionally satisfactory articles have been examined that have failed to appeal aesthetically.

It is considered that manufacturers should get down to basic principles in applying these materials to building and not slavishly copy traditional materials. If this can be done, plastics particularly need no longer be regarded as a cheap imitation but will enter the field as serious competitors in their own right.

Laminates in Building

Decorative laminates such as Warerite are being increasingly used in building applications on land and afloat. Two of the photographs on page 645 show interiors where easy cleaning and hygiene are of importance. These considerations are also instrumental in the choice of Warerite for the decorations and fittings of the swimming pool on the new Canadian Pacific liner *Empress of Canada*, where the coral pool combines the aesthetic with the aseptic. Striking designs and brilliant colours have been used without in any way reducing the high standard of hygiene and constant cleanliness usually associated with swimming pools.

British Transport hotels and catering services have also made use of Warerite to line the walls of their new buffet cars.

Filon Price Cut

BIP Reinforced Products Ltd. has made price reductions of 5-10% in Self Extinguishing Filon structural sheeting, effective immediately.

S.E. Filon is described as being made by 'embodying fire extinguishing chemicals into the nucleus of the molecule of the resin during its manufacture'. The result is that the chemicals are permanently locked within the molecular construction and are only released to play their part when subjected to flame.

Highest Classification

This material has been awarded the highest possible classification of EXT.S.AA. under British Standard 476: Part 3: 1958. This means that although it will take flame it will extinguish itself immediately the source is removed.

RUBBER AND PLASTICS IN BUILDING

The Haus That Hüls Built

ARCHITECTS AND BUILDERS MEET THE CHEMIST

AMONG the wide range of synthetic materials manufactured by Chemische Werke Hüls are polythene, pvc, polyester resins and styrene butadiene rubber.

Being one of the major West German plastics producers, and realizing the enormous potential in the use of plastics in the building industry the company has organized an exhibition at its works in Marl, Kreis Recklinghausen, devoted to building applications of Hüls products. In conjunction with the exhibition, study sessions have been held intended to serve as a means for the exchange of ideas between Hüls's chemists, and architects and builders.

Chairs in the house are moulded from glass reinforced plastics and upholstered in pvc

The two main objects have been on the one hand to spread knowledge on the uses of plastics in building and on the other to hear from the man on the job — the architect or builder — what special requirements he expects from these synthetic materials.

Special Problems

This very forward thinking and realistic approach to the subject must surely pay dividends. The use of plastics in applications for which they are not ideally suited may be prevented, and the attention of the manufacturers and chemists may be focused on any special problems in techniques and fabricating methods encountered in the use of what must still be considered unconventional materials.

The exhibition illustrates about 30 different fields of application of plastics in building and as an experiment a specially constructed plastics house has been built.

The aim in the building of this house — intended to serve as a changing room for the Hüls tennis club — was to discover how far plastics could be used in building, disregarding the immediate practicability and previously used methods of construction and paying no regard to the economics involved.

Field Trial

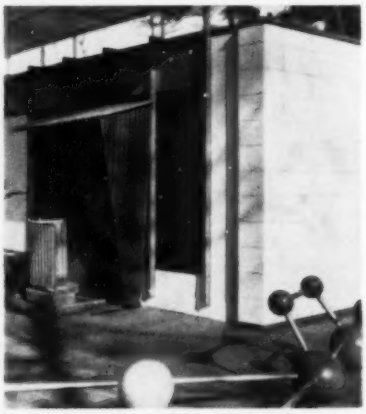
This is expected to give valuable data and information to Hüls's architects, builders and engineers, and it must be assumed that the economic problems will be solved in time.

Suggestions included in the exhibition and house are numerous and range from artistic applications to ideas which will ultimately result in lower costs and reduced maintenance.

The flat roof of the house is formed from corrugated sheets of Vestolen pvc, a material which has found several other applications in piping, flooring, stair edges and skirting boards and for handrail coverings.

Artistic Possibilities

New possibilities have been given to the creative artist by the use of Vestopal polyester resins which have been used to produce wall decorations and all plastic windows designed and made by the sculptor Heinken. Polyester resin has also proved to be a very suitable material for coating concrete and to form the basis for putties, mortars and concrete mixes. It is an ideal binder for ground quartz, sand, gravel and stone chips, and allows the manufacture of a road or floor surface which is very resistant to oil and petrol.



Mainly vinyl flooring has been used: the 'molecule' in the foreground is both a decoration and a symbol of the project

Plastics permit an increasing amount of prefabrication work to be done and Hüls believe that this will make an important contribution towards their use in the future. They feel that, although the all-plastics house is still a dream and may always be so, there are plenty more building uses for plastics which await discovery and development.

General view of the all-plastics house **(another picture appears on page 645)**

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

WHERE to now? This is one of the big questions facing stock market operators at present. With the Budget over and satisfactorily digested, people are wondering if in the coming summer holiday months there will be sufficient factors to sustain the rise that has so far occurred during the opening months of this year. In the past week caution has become the keynote of trading activity with buyers becoming more selective. International politics have become a restraining influence and gains have become harder to establish overall. Setbacks, however, were minor events, and there is still plenty of evidence to suggest that given the right kind of encouragement investors can still expect a better return on their shares before the year 1961 comes to an end.

Company news has been pouring out from the boardrooms of industry. In the week which included the Budget, there were no less than 90 preliminary announcements, many of them producing increases in dividends for shareholders. DUNLOP, for instance, stepped up theirs by 1d. to 1s. 7d. a share. Trading profits of this giant rubber group were 3% up at £23.2m. After a higher depreciation charge, however, the net figure comes out at £6.6m. compared with £7.1 previously. BRITISH INSULATED CALLENDER'S CABLES produced profits very much in line with a forecast made last November. Group sales totted up to £143m. an improvement of £15m. And there was a trading surplus of £9,022,200 against £9,011,100. What came as a bit of a surprise was the directors' plans for raising £15m. of new money. This will be provided by means of a public issue of debentures, and a 'Rights' issue on a one-for-seven basis at a price to be determined later. First report from BETTIX since its conversion into a public concern must have pleased shareholders. Talking about future prospects, chairman Mr E. E. G. Boite said that during 1960 orders reached a record total and to date 'this level has been maintained during the current year'. Subject to unforseen circumstances the board looks forward to another successful year of trading.

Same kind of message of good cheer came from the annual statement of Mr C. H. Tanner, head of the F. W. BERK chemical group. The current year has started satisfactorily — particularly as regards exports. Business in the first quarter of this year indicates that sales have been more than

Continued on page 668

Share Price Movements

Par Value	Company	1961 High	Low	April 15	Latest
£1	A.E. Ind. Ord.	48/6	40/3	44/3	45/3
5/-	Albright & W. Ord.	28/6	26/3	27/3	28/3
£1	" " " 5% Pref.	17/3	14/6	14/6	14/9
5/-	Anchor Chemical Ord.	23/-	16/-	20/-	20/6
4/-	Airfix	52/6	34/6	49/6	50/6
4/-	" Non Voting	48/3	33/6	45/6	47/9
5/-	Andersons Rub. Ord.	—	—	3/9	3/9
£1	Angus Geo. Ord.	74/-	58/6	73/-	74/-
5/-	Ault & Wiborg Ord.	28/9	25/9	28/6	28/6
£1	Avon India Rubber Ord.	46/6	30/-	37/6	37/9
£1	" " " 6% Pref.	19/3	18/3	18/9	18/9
10/-	Bakelite Ord.	58/-	42/3	55/9	57/3
£1	" 6% Pref.	19/3	16/6	18/-	18/-
£1	Baker Perkins Ord.	58/6	40/6	55/-	58/3
4/-	Bank Bdg. Rubber Ord.	3/6	1/9	3/6	3/6
4/-	Bettix	11/9	7/6	11/3	11/6
4/-	Brammer H. Ord.	17/-	16/-	16/6	16/6
10/-	Bridge, David Ord.	58/-	46/9	56/3	56/-
5/-	Bright, John Ord.	16/9	13/9	16/6	16/6
5/-	Brit. Blting & Asb. Ord.	22/6	17/6	20/3	22/6
£1	" " " " Pref.	—	—	15/9	15/9
5/-	British Electronic Indus.	15/6	12/-	14/4½	14/6
2/-	Brit. Ind. Plas. Ord.	13/9	7/9	13/9	13/9
2/-	" 10% (tax free) Pref.	4/9	4/6	4/9	4/9
£1	British Xylonite Ord.	90/-	63/-	90/-	90/-
£1	" " 5% Pref.	18/9	14/-	14/4½	14/4½
£1	BICC Ord.	60/-	50/3	58/6	60/-
5/-	BTR Ind. Ord.	19/9	13/6	18/6	17/9
£1	" " 7½% Pref.	21/6	20/9	21/3	21/-
£1	Courtaulds Ord.	46/6	41/-	43/9	42/3
£1	" 5% 1st Pref.	15/6	14/9	15/-	14/9
£1	" 6% 2nd Pref.	18/3	16/9	17/9	17/6
4/-	Cow, P. B. Ord.	10/3	7/6	9/7½	10/1½
£1	" " 5% Pref.	14/3	13/3	13/6	13/6
1/-	Dannimac Mfg. Ord.	15/-	12/-	14/6	14/9
10/-	De La Rue Ord.	66/-	56/-	60/9	65/-
£1	" " " 3½% Pref.	10/6	9/6	10/-	10/-
10/-	Distillers Co. Ord.	38/3	30/-	37/-	38/1½
£1	" " 6% Pref.	20/3	18/3	19/-	18/9
£100	" 5% Conv. Loan	£96	£91	£95	£95
£100	" 5½% Unsec. Loan	£86½	£80½	£80½	£80½
10/-	Dunlop Rubber Ord.	27/3	21/6	25/-	26/7½
£1	" " 5½% Pref.	16/-	15/-	15/6	15/6
£100	" 3½% 1st Debs.	£69	£67	£68	£68½
£100	" 4½% 2nd Debs.	£79	£76	£78	£77½
£1	Eng. Elect. Ord.	£40/6	32/3	37/-	37/6
4/-	Ebonite Cont. Ord.	8/6	7/6	8/3	7/7½
£1	English China Clays Ord.	111/6	80/-	106/3	111/6
£1	Goodyear Tyre 4% Pref.	11/6	10/9	11/3	11/3
5/-	Greeff Chem. Ord.	32/6	22/9	30/6	31/-

Par Value	Company	1961 High	Low	April 15	Latest
10/-	Greeff Chem. 5½% Pref.	8/3	7/9	7/6	7/6
4/-	Greengate & Irwell Ord.	6/3	5/6	5/9	6/3
5/-	Hackbridge Hldg.	6/9	4/9	6/3	5/6
£1	Harrisons & Crosfield Dd.	57/6	48/9	55/-	57/6
1/-	Hunt & Moscrop Ord.	2/3	1/3	2/-	1/10½
£1	Imp. Chem. Ord.	75/9	63/-	73/9	75/3
£1	" " 5% Pref.	15/9	14/9	15/-	15/1½
£100	" 4½% Unsec. Loan	£82½	£78	£79½	£79½
£100	" 5½% Conv. Loan	£93	£87	£90	£87
1/-	Kleemann (O. & M.) Ord.	19/3	8/3	18/3	16/9
£1	" 6½% Pref.	17/6	16/3	16/3	16/3
5/-	Laporte Ind. Ord.	30/9	24/-	28/9	28/6
£1	" " 7½% Pref.	23/-	21/9	21/9	21/9
£1	Leyland & Birm. Rubber Ord.	59/3	46/3	58/-	59/-
£1	" " " 6% Pref.	18/9	17/6	18/1½	18/1½
2/-	London Rubber	14/9	9/6	20/9	14/9xc
£1	" 6% Red. Cum. Pref.	20/-	17/6	17/6	17/6
£1	McKechnie Bros. Ord.	60/-	53/6	55/-	60/-
£1	" " 'A' Ord.	57/6	52/6	55/-	57/6
£1	" " 6% Cum. Pref.	18/-	16/-	17/-	17/-
5/-	Monsanto Chem. Ord.	27/6	23/-	24/9	25/3
£1	" " 3¾% Pref.	12/6	11/6	12/-	12/1½
£100	" " 6% Debs.	£98	£95½	£97	£95½
5/-	Miles (H.G.) Hldgs. Ord.	7/9	7/-	7/-	7/-
2/-	Movitex	—	—	6/7½	6/9
£1	North British Rubber	21/3	13/9	13/9	13/9
5/-	Northwestern Rubber	13/-	9/-	12/-	12/-
5/-	Plastic Enginrs. Ord.	37/6	28/6	37/6	37/-
10/-	Projectile & Eng. Ord.	48/-	22/6	34/-	47/6
5/-	Redfern Holdings Ord.	3/9	3/-	3/3	3/6
2/-	RFD Ltd. Ord.	5/-	3/9	4/3	4/4½
£1	" " 5½% Pref.	15/-	12/6	12/9	13/6
2/-	Rubber Imp. Ord.	6/3	3/3	4/-	4/3
2/-	" " 'A' Ord.	5/-	2/9	3/-	3/-
£1	" " 5% 1st Pref.	13/3	11/3	12/3	12/3
5/-	Rubber Reg. Ord.	17/6	16/9	17/3	17/6
4/-	Shaw Francis Ord.	24/6	18/9	23/-	24/3
2/-	Silentbloc Ord.	9/6	8/3	9/3	9/4½
5/-	Storey Bros.	46/-	35/-	42/3	42/9
2/-	Sussex Rubber Ord.	2/7½	1/9	1/10½	2/6
5/-	Sutcliffe Speak Ord.	17/6	13/6	16/3	17/6
£1	Tootals	34/3	28/-	33/9	33/-
£1	Turner & Newall Ord.	76/3	55/-	73/9	74/9
£1	" " " 7% Pref.	21/6	20/9	21/3	21/-
5/-	Universal Asbestos Ord.	25/6	21/3	22/3xc	22/-
5/-	Viscose Dev. Ord.	15/6	13/3	15/6	14/-
5/-	Warne W. (Holdgs.) Ord.	21/-	14/9	21/-	20/4½

Rubber Markets

LONDON

Quotations followed fairly closely the Eastern course and moved irregularly in a thin market. A fair proportion of the Terminal business recorded represented switching and short covering. Political uncertainties brought in some speculative demand and added to the reservedness of sellers. Consumer offtake was patchy.

Latest prices are as follows:

No. 1 RSS Spot: 26¾d.-27d.

Settlement House:

June 26¾d.-26⅞d.
July/September 26⅞d.-27d.
October/December 26¾d.-26⅞d.
January/March (1962) 26¾d.-26⅞d.
April/June 26⅝d.-26¾d.

No. 1 RSS cif basis ports:

May 26½d.-26⅝d.
June 26½d.-26⅝d.
July 26½d.-26⅝d.

Godown:

May 90 Straits cents nominal.

LATEX

Centrifuged 60% latex per gallon in drums, seller, May, 15s., cif European ports. Spot, seller, 15s. 6d. Bulk, seller, d.w. 15s. Creamed, seller, 14s. 9d. nominal. Normal, seller, May, 12s. 3d.

NEW YORK

The New York rubber market ruled as under on April 24:

DEALERS' PRICES

	US cents per lb., ex-dock	
	April 24	Previous
No. 1 RSS, May	31⅝b–32a	32b –32⅛a
June	31⅝b–31⅞a	31⅜b–32a
No. 2 RSS, May	31⅜b–31⅞a	31⅞b–32⅛a
June	31⅛b–31⅜a	31⅜b–31⅝a
No. 3 RSS, May	31⅛b–31⅜a	31⅜b–32a
June	31⅜b–31⅝a	31⅛b–31⅜a
No. 1 RSS, Spot	32n	32⅛n
No. 3 amber blanket crepe, May	26⅛n	26⅛n

FUTURES—REX CONTRACT

	April 24	Previous
May ..	31.90b–32.25a	32.05b–32.25a
July ..	31.80b–31.90a	32.05t
Sept. ..	31.60t	31.98t
Nov. ..	31.50b–31.57a	31.80b–31.90a
Jan. ..	31.30b–31.40a	31.65b–31.80a

Sales: 69. Tendency: Steady.

Futures, after early steadiness on April 24, eased in scattered selling. Some sources believed the selling might reflect Laos developments. Dealings were fair. Physical rubber was quiet. The undertone was about steady. Later in the day, futures were barely steady.

SINGAPORE

The market opened on an uncertain note on April 24. Prices were steady and sellers were holding off. After early short-covering, the market eased on profit-taking and lack of demand for other grades. There was some liquidation from up-country centres which was confined to No. 1 sheet. Factories were quiet. The market ruled steady in the afternoon. There was interest in Nos. 1, 2 and 3 sheet. Trading was fair.

	Malayan cents per lb., fob Malayan ports to open ports	
	April 24	Prev. Close
No. 1 RSS, May ..	91⅜–91½	91¼–91⅜
June ..	91⅜–91½	91⅜–91¼
No. 2 RSS, May ..	90⅞–91¼	90⅞–91¼
No. 3 RSS, May ..	90 –90⅜	89⅝–90¼
No. 4 RSS, May ..	86⅜–87¼	86⅜–87¼
No. 5 RSS, May ..	78¼–79¼	78¼–79¼
No. 1 RSS, Spot ..	90⅞–91¼	90¼–91
No. 3 blanket thick remilled crepe, May	72 –73	73 –74
No. 1 fine pale crepe, May	95½–96½	96⅜–97⅜
2X thin brown crepe, May	69½–70½	69⅜–70⅜

Tendency: Steady.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob, at 176.00d. per gallon.

AMSTERDAM

The Amsterdam rubber market ruled as under on April 24:

	Guilders per kilo	
No. 1 RMA:	April 24	Previous
April	2.54	2.54
May	2.54	2.54
June	2.54	2.54
April/June ..	2.54	2.54
July	2.52	2.52
August	2.52	2.52

Sales: Nil. Tendency: Quiet.

DJAKARTA

In the morning session of April 24, some buyers were reported at 37.50 rupiahs per kilo for sheet No. 1 for ready delivery, but sellers were reluctant and maintained the price at 38 rupiahs. Later in the day, sellers reduced their asking price for sheet No. 1 to 37 rupiahs per kilo but no transactions took place. The market closed very quiet.

	Rupiahs per kilo	
	April 24	Previous
Spot No. 1 Priok ..	37.75b	37.00b
Spot No. 2 Priok ..	35.75b	36.00b
Spot No. 3 Priok ..	34.25b	34.50b
No. 1 fine pale crepe, Spot	31.50b	31.25b

Tendency: Quiet.

BANGKOK

The price of No. 1 RSS at Bangkok on April 24 was 29.0 (29.0) US cents per lb.

CEYLON

The price of No. 1 RSS at Colombo on April 24 was 113¼ (113) Ceylon cents per lb.

Material Prices

Owing to pressure on space Material Prices and Plantation Newsletter have been held over. Material Prices will appear in the May 13 issue.

STOCK MARKET

Continued from page 667

maintained. But there was a warning that costs are 'constantly tending to rise'.

From BAKER PERKINS came an 'as forecast' payment of 11¼% for the year, compared with the equivalent of 8% allowing for the one-for-four share bonus made during 1959. Before tax the profits of the company were £1,193,200, a good improvement over the previous £771,500. As already known the board hope to maintain 11¼% for 1961 on the capital which was increased by the seven-for-25 rights issue made in February.

Overshadowing them all was I.C.I. with its full report on how trading went in 1960. Highlights from the chairman's speech included many points of interest and spotlighted the fact that exports of the group were a record amounting to £96.6m. — an increase of 10% over the previous 12 months.

Sales in the home market were 9% higher and were the best ever. The sales volume was 11% up but as a result of further price reductions, home prices fell by around 2% overall, equivalent to a reduction of about £5m. in income. Nearly all divisions shared in the increased business. At the end of last year the number of UK employees was 113,699 compared with 109,596 a year earlier and under the company's profit-sharing scheme 93,229 qualified for a total bonus of £7,305,956 gross or £5,522,989 net after tax. This worked out at an average of £78 7s. 4d. gross per person.

Foam Conference Lectures

The conference on foamed rubber and plastics arranged jointly by the London sections of the Plastics Institute and the Institution of the Rubber Industry on May 5 (*RPW*, January 21, 86) will include six lectures. The provisional titles of these and the authors are as follows: permeability of gelled latex foams, by K. O. Calvert (Dunlop); polyurethane foams, by J. M. Buist (I.C.I.); cellular polystyrene, by W. B. Brown (Monsanto); flexible foamed pvc, by I. D. Maxton (Elson and Robbins); new developments in flexible foams, by S. B. Cant (Lintafoam); and low temperature studies on expanded ebonite, by A. Cooper (Expanded Rubber Co.).

BRP's EPOK A1700

British Resin Products Ltd. has reduced the price of its Epok A1700 water soluble resin by £36 a ton, as reported in last week's *RPW* (page 603). It was incorrectly stated in this report that the resin is an epoxy, whereas it is, in fact, an alkyd resin.

The reduction means that water-based paints can now be made and sold at prices below conventional solvent systems.

Industry INTELLIGENCE

Technical Data

Organic Pigments

Kingsley and Keith (Chemicals) Ltd. has been appointed sole distributors in the British Isles for the Harmon Colour range of organic pigments manufactured in the USA by Allied Chemical Corporation of New York. The Harmon colour factory specializes in the manufacture of organic pigments. Recently, Harmon has developed a number of highly specialized lightfast pigments which have good heat resistance and brilliance.

Pigments which are of interest to the plastics industry include Indofast brilliant scarlet, Indofast yellow greenish lake, Indofast orange, Thio fast red, Quindo magenta and Indofast violet. Further specialities of the range are the concentrated dry dispersions of these pigments in pvc, cellulose acetate or other resins. Use of these dispersions can overcome problems in the colouring, for example, of rigid pvc or in other similar difficult applications.

Information, samples and commercial supplies are available upon request from Kingsley and Keith (Chemicals) Ltd., Rex House, 38 King William Street, London.

Acrylic Film-Forming Resin

A new acrylic film-forming resin known as Carboset 511 has been introduced by B. F. Goodrich Chemical Co. The resin is a solution of an acrylic polymer that dries at room temperature to a clear, tough, glossy, water-insoluble film. It is supplied as a 45% solution in water but is also available in alcohol solution. Carboset 511 is compatible with water dispersions of most polymers. Films of Carboset 511 are claimed to adhere well to metal, glass, paper and leather and to Mylar, polythene and vinyl films, being water resistant and able to withstand even the effects of boiling water. Thin films can be removed with soap while thicker films can be removed with dilute bases. This alkali-solubility of the films is not affected by ageing.

The flow characteristics of Carboset 511 solutions and the adhesive properties of their dried films indicate utility in coatings and printing inks for a variety of substrates. It dries at room temperature to a water-insoluble film and has been suggested for use as a floor polish additive. Carboset 511 has also demonstrated ability as a clay binder in paper coatings in laboratory tests. It is compatible with common clays and its thermoplastic nature makes it suitable for calendering.

Work underway at BFG Chemical's Products Application Laboratory also indicates that thin films of Carboset 511 can be used to protect such items as highly polished metal sheets during shipment. When the sheets are ready for use, the film can be removed with a mild alkali such as 2% ammonium hydroxide.

Machines, Materials and Equipment

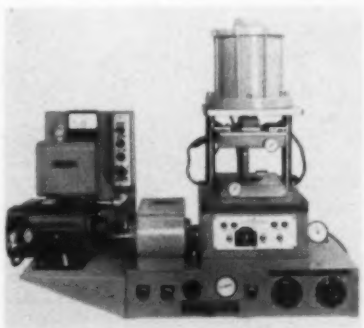
Photo-Copying Centre

A new company, Convoy Copying Consultants Ltd., has now opened what is claimed to be Britain's first Photo-Copying Machine Centre, at 33 New Cavendish Street, W.1.

It is now claimed that any visitor to the Centre will be able to confidently select the machine suited to his requirements. The company specializes exclusively in copying machines and reproduction techniques, offers the opportunity of seeing in one place a comprehensive range of all processes selected from known makes and types available. A staff of highly-trained consultants is in attendance, and a free-of-charge maintenance service is given.

Mooney Viscometer

Two classes of material which have brought about the need for measuring viscosity at widely different rates of shear — plastics and high molecular weight elastomers — have resulted in the development of a Mooney shearing disc viscometer with a new variable speed drive. This permits measurement



of viscosity at different rates of shear, thus providing the information required in processing today's rubber and plastics materials.

The drive provides shear rates from .05 to 20rpm, and has a convenient Tachometer to aid in rate setting. This variable speed viscometer is a modification of the Scott Model STI Mooney Viscometer, known for its value in controlling physical characteristics to ensure maximum quality in the manufacture of elastomeric products.

The recently introduced dual-pen electronic recorder with automated controls is equally usable with the variable speed viscometer. This recorder displays records of specimen temperature and viscosity in Mooney units simultaneously on one chart.

Further information can be obtained from the manufacturer, Scott Testers Inc., 124 Blackstone Street, Providence, R.I.

Materials Handler

A machine which can lift a container weighing up to 10cwt., and will then tip it so as to empty the contents into a hopper, or other receptacle, has been developed by Russell Constructions Ltd., Russell House, Adam Street, London, W.C.2.

Containers are lifted in a cradle which can be adapted to take a variety of units such as drums, skips and sacks. The cradle runs on guide rails within the vertical section of the equipment, and these vertical sections can be built up as required using standard sections each 4ft. 6in. in height.

Publications

Cellobond Resins

Technical manual No. 12, recently produced by British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1, is a 230-page book on Cellobond polyester resins which is being distributed on request to bona fide users of the materials.

While the book is intended to be used as a guide to customers of BRP on the use of their products, it is, in fact, a very comprehensive handbook on the techniques and applications of reinforced polyester resins and, as such, will undoubtedly find a place on the bookshelves of many technical libraries and laboratory and production technicians.

The introduction gives the general properties of reinforced mouldings and the chemistry of polyester resins, the Cellobond range of polyesters and ancillary products is described, and other materials including fillers and reinforcement are also dealt with.

The fabrication processes are described in some detail as are the properties of the laminates and castings so produced.

The final chapters are devoted to workshop layout and hygiene; machining and assembly; production forecasting, costing and estimating; planning; and training and bonus schemes, while six appendices give further useful information.

Polyether Film

A new 16 mm. colour film describes in detail the manufacture of one-shot polyether based foam incorporating Dabco catalyst, which is manufactured by the Houdry Process Corporation. Jacobson Van Den Berg and Co., 3-5 Crutched Friars, E.C.3, has a number of copies of the film available.

CLASSIFIED ADVERTISEMENTS

RUBBER AND PLASTICS WEEKLY

APPOINTMENTS VACANT

6d. a word, Minimum 12/6 Box 2/-

AN unusual opportunity is open to a young salesman with ideas, whose experience covers laminated and spread textiles in the rubber and plastics fields. The appointment will be based on the factory sited a few miles north-east of Manchester. A generous salary will be paid to a suitable candidate, and a car will be provided.—Applications, which will be treated in the strictest confidence, should contain comprehensive details of business career, and should be made to Sales Director, Box 990. (990)

A RUBBER technician is required by a firm in the Manchester area, to work on the development of a wide range of natural and synthetic rubber compounds. Applicant must have attained at least LIRI standard, and experience in compounding would be an advantage. Part-time day release would be allowed for study on a recognised IRI course.—Write giving details of age, qualifications and experience to Box 1012. (1012)

ASSISTANT chemist required by medium-sized company manufacturing sponge and mechanicals. He will be required to supervise the compounding section of the laboratory under the direction of the Chief Chemist. This is a first-class opportunity for a man under 35 who has had several years' experience in works or laboratory to become a member of an expanding and very progressive organisation.—Write giving full details of experience, qualifications, positions held and salary required to Box 996. (996)

LABORATORY assistant, male or female, required for rubber and plastics factory in South-West London, for testing and control of raw materials. Good opportunity with progressive firm.—Write stating age, experience and salary required to Box 982. (982)

APPOINTMENTS VACANT

STAFF APPOINTMENT

DESIGNER AND FITTER ENGINEER OF HOSE COUPLINGS

A vacancy exists for a new staff appointment with an old-established and progressive rubber hose manufacturer in Hertfordshire as a fitter engineer for designing and supervising the assembling of low pressure and high pressure cotton and wire braided hose couplings, and other hose fitting work.

Excellent prospects for staff promotion.

Age between 30 and 40 years. Previous experience very necessary.—Box 966. (966)

STEWARTS and Lloyds Plastics, of Boreham Wood, Herts., have the following vacancies for experienced personnel. Extrusion operators, fabricators, storekeepers, etc. The works is at present located at the above address but will be moved early in 1962 to Huntingdon. Housing assistance may be given.—Apply in writing to Drayton Road, Boreham Wood, Herts. (1016)

National College of Rubber Technology

HOLLOWAY ROAD, LONDON, N.7

Applications are invited for Scholarships providing up to £360 per annum for fees and maintenance at the National College of Rubber Technology.

Scholarships are normally for three years from university entrance level for polymer courses covering the basic science and specialised technology required by professional rubber technologists or plastics technologists. Science graduates may apply for a one-year scholarship for an Associateship rubber or plastics course; such awards being renewable for research. Applicants must have attained the age of 18 years by August 31, 1961, be British subjects ordinarily resident in the United Kingdom, and have obtained the standard of education required.

Full details and form of application will be sent on request.

R. H. CURRELL, F.C.A.
Clerk.
(1001)

RUBBER TECHNOLOGIST

FOR

MIDLAND SILICONES LIMITED

AT BARRY, SOUTH WALES

The Process Development Group of Midland Silicones Limited requires a Rubber Technologist. Applicants, aged under 32, should have either LIRI or HNC Chemistry with at least five years' experience in the Rubber Industry, or AIRI without industrial rubber experience. The work involves investigation of plant problems, scale up of new products and new processing techniques of silicone rubbers and silicone polymers.

Midlands Silicones Limited is a Company of the Albright and Wilson Group which is rapidly expanding. The Works and laboratories are situated in a pleasant environment. Non-contributory pension and housing schemes are in operation.—Apply (quoting Reference No. 58) to:

Staff Officer,
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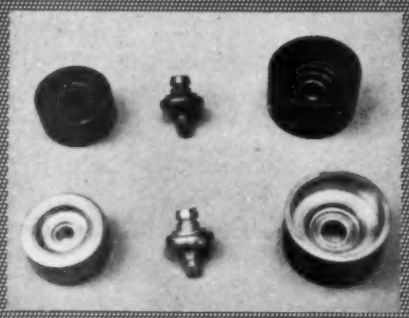

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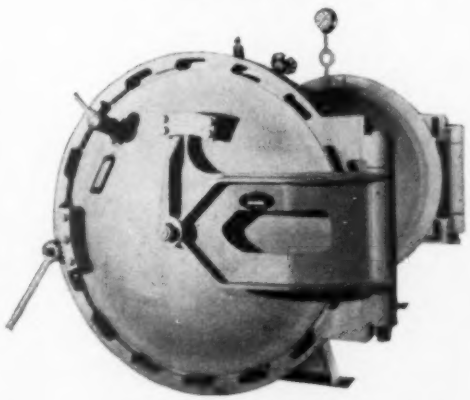

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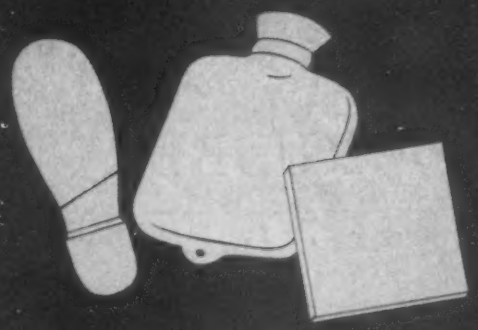

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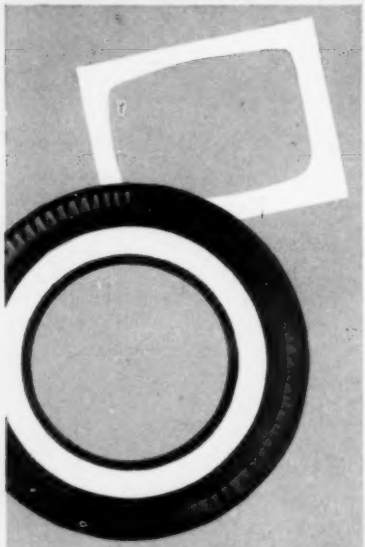

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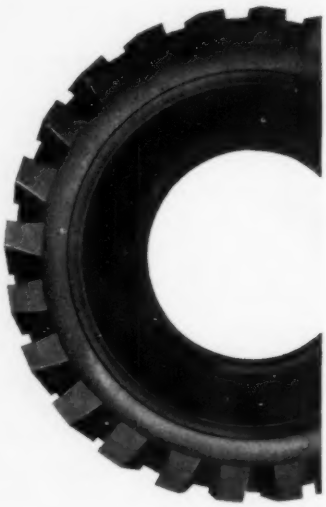

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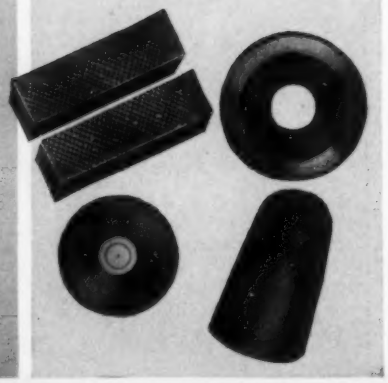

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